

# Ferroelectricity Newsletter

A quarterly update on what's happening in the field of ferroelectricity

Volume 9, Number 1

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## FOCUSING ON THE NEXT GENERATION OF SCIENTISTS

This first issue of the *Ferroelectricity Newsletter* in the new millennium highlights the **Third Asian Meeting of Ferroelectrics (AMF-3)** held 12—15 December 2000 in Hong Kong. A glimpse at the history of this relative newcomer to the international conferences on matters of ferroelectricity and related fields brings the rapid growth of this scientific discipline into sharp focus.

The **First Asian Meeting of Ferroelectrics**, convened 5—8 October 1995 in Xian, China, was concurrently held with the Second East Asia Conference on Chemical Sensors (EACCS-2) and the International Conference on Electronic Components and Materials with the International Conference on Sensors and Actuators (ICECM-ICSA'95). One hundred and eighty-five participants from 12 countries and regions attended the meeting. Many of the registrants of the concurrent meetings also participated in some of the academic activities of AMF-1.

The **Second Asian Meeting of Ferroelectrics** took place from 7 – 11 December 1998 in Singapore. Professors Zhu Weiguang and Yao Xi editorialized in the proceedings: "The AMF-2 received 345 abstracts and scheduled 310 (43 invited) presentations with 203 registered participants. The participants and papers came from 22 countries and regions in five continents. These figures of AMF-2 give not only a clear indication and testimony of the strong growth and active development of ferroelectric research in Asia, but also show that AMF has become an international forum for the ferroelectric community around the world, not just for the Asian community."

A significant development at **AMF-3** was the fact that among the 450 participants 130 were students from around the region, including 95 from China and 25 from Korea. This didn't just happen. In their invitation to the conference, the organizers said that this conference is "an excellent opportunity for local and regional participants, especially Asian students, to meet and interact with international scholars in the field of ferroelectrics." Obviously, the scientific community leaders understand the importance of providing advanced training for the next generation of researchers. In this context I would like to refer our readers to Professor L. Eric Cross' article "Changing conditions for younger scientists entering the ferroelectric field," published in the *Ferroelectricity Newsletter* Vol. 7, No. 1, where he takes a look at the conditions necessary to ensure a vigorous future for the ferroelectric community.

Rudolf Panholzer  
Editor-in-Chief

## IN THIS ISSUE

From the Editor	1
Conference Reports	
AMF-3	2
Ferroelectrics UK 2000	24
Papers	
AMF-3	4
Ferroelectrics UK 2000	25
Upcoming Meetings	
ACCGE-13	26
APMC 2001	27
Calendar of Events	28

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**CONFERENCE REPORT**

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***THIRD ASIAN MEETING ON FERROELECTRICS (AMF-3)***

The third Asian Meeting on Ferroelectrics was organized by the Department of Applied Physics, the Hong Kong Polytechnic University, 12 to 15 December 2000. The conference was well attended with about 450 being present and exceeded the expectations of the organisers. A majority of those present were from academic institutions, including a relatively large number of students (about 130) from around the region, including 95 from China and 25 from Korea. With such a large number in attendance, commercial vendors missed a unique opportunity to exhibit their products to this captive audience. Only AixACT, AIXTRON, Radiant Technologies, and Gordon and Breach had the foresight to exhibit at this well-attended meeting, even though many of those present would use a range of equipment and also be consumers of materials in the course of their research.

The event sponsors were AixACT and AIXTRON, both from Aachen, Germany, Gordon and Breach Science Publishers, IEEE Ultrasonics, Ferroelectrics and Frequency Control Society, the Innovation and Technology Commission from the government of Hong Kong and the Faculty of Applied Science and Textiles from the Polytechnic University. Throughout the meeting a succession of tasty meals and refreshments were provided by the University, most if not all, being sponsored by the commercial vendors. A bus tour to the Stanley Market and the Hong Kong Island Peak District, sponsored by AIXTRON, was also a popular social feature of this meeting.

The conference format included invited, oral, and poster papers, with parallel sessions being used for most of the day. More than 420 papers were presented, a number that rivals international ferroelectric meetings. A complete list of which is provided as part of this report. From recent ferroelectric meetings —and AMF-3 was no exception — it is obvious that the science of ferroelectric materials has come a long way in the last 20 years. There are state-of-the-art devices recently offered in several application areas. In addition to varactors and — these include low integration level lead zirconium titanate (PZT) ferroelectric memories (FRAMs) for smart card and other uses. They also have a large potential market in wireless communications uses, where currently ferroelectric devices are in short supply.

Higher integration level devices such as DRAMs have recently been announced by Samsung and Matsushita. In these 4Gbit RAMs the low dielectric value silicon dioxide has been respectively replaced with high dielectric constant PZT by Samsung and by barium strontium titanate (BST) by Matsushita. In addition to personal computer uses, ferroelectric memory (FRAM) have potential audio and video applications. A 4Gbit RAM would be ideal for digital cameras and a 250 Mb is required for audio recording.

Probably the most relevant comments were provided by the members of the Applications of Ferroelectrics in the 21<sup>st</sup> Century panel during that evenings session. The panel contributors were Bob Newnham — Penn State, Jim Scott — Cambridge, Amar Bhalla — Penn State, Nara Setter — EPF Lausanne, Wolfgang Wersing — Siemens, Kenji Uchino — Penn State, Yao Xi — Tongji University, and Iko Yoo — Samsung.

Jim Scott sees the need to update the ferroelectric curriculum for students to include such topics as electrode technology and phase transitions and the requirement for a different industry offering thin film memories, starting with small devices. Nara Setter sees the need for more cross disciplines, between hardware and software, between dielectrics/magnetics semiconductors and conductors, and between applications, fundamental research and technology. Bob Newnham sees benefits from more team work between countries to expand research and application fields. He also thought that this industry needs to be more conservative and use the knowledge to make money. It will take longer for basic research, but if applied five years ago, FRAMs would be already commercialized.

According to Iko Yoo, Samsung has PZT FRAM devices ready for production and pyroelectric emission is a promising application (above the transition temperature). He also stated that ferroelectric materials are ideal for the personal chip to monitor blood, temperature, etc.

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**CONFERENCE REPORT**

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According to Kenji Uchino, the current buzz words for research funding are information technology, biotechnology, and ecology and ferroelectric materials find application in all these fields. Some examples are compact ultrasonic piezoelectric transformers, 3mm size electric motors ferroelectric MEMS, compact actuators for office equipment and photo-devices that can change light into sound without current. Ferroelectric materials can also create very large forces and will become very important for MEMS, i.e., FMEEMS.

Some concern was expressed about the introduction of lead into the environment from PZT based devices, but the hazard from PZT transducers must be classed as a very minor threat to the environment when compared with the current lead exposure from old (and new) car batteries. However, the Japanese government has limited such uses of lead to 20 years. Lead standards vary widely around the world. For example, in the USA and Europe lead is being removed from drinking water, but in Australia leaded gasoline is still used.

Although prognostications that ferroelectric behavior should disappear as the film thickness decreases, ferroelectricity is here to stay since a 3-molecular layer of poly vinylidene fluoride (PVDF) still exhibits ferroelectric behavior.

— Alan Mills

**NEW PUBLICATIONS FROM MRS*****Substrate Engineering—Paving the Way to Epitaxy***

This volume focuses on recent developments in novel substrate engineering which enable improved epitaxy. In particular, the volume brings together groups developing and improving novel substrates with those using them for film growth and device fabrication. Topics include biaxially textured substrates for high- $T_c$ -coated conductors; surfaces for oxide epitaxy; wafer bonding and lift-off; lattice mismatch engineering; substrate engineering; and solid-phase recrystallization and epitaxy. 2000, hardcover, 28 papers, 228 pages.

Volume 587 from the MRS Symposium Proceedings Series (1999 MRS Fall Meeting, Boston, MA)

ISBN: 1-55899-495-5; \$78.00 MRS members, \$90.00 US list, \$103.00 non-US list

Editors: David Norton, Oak Ridge National Laboratory; Darrell Schlom, The Pennsylvania State University  
Nate Newman, Northwestern University; David Matthiesen, Case Western Reserve University

**This volume is also available electronically on the MRS website [www.mrs.org/books/](http://www.mrs.org/books/) with free access for all current MRS members.**

**For more information on related topics, consider these volumes from MRS:**

***Epitaxial Growth—Principles and Applications (Volume 570)***

(1999 MRS Spring Meeting, San Francisco, CA) 1999, hardcover, 42 papers, 318 pages

ISBN: 1-55899-477-7; \$62.00 MRS members; \$73.00 US list; \$80.00 Non-US list

***Mechanisms and Principles of Epitaxial Growth in Metallic Systems (Volume 528)***

(1998 MRS Spring Meeting, San Francisco, CA) 1998, hardcover, 26 papers, 278 pages

ISBN: 1-55899-434-3; \$69.00 MRS members; \$79.00 US list; \$90.00 Non-US list

***Evolution of Epitaxial Structure and Morphology (Volume 399)***

(1995 MRS Fall Meeting, Boston, MA) 1995, hardcover, 79 papers, 561 pages

ISBN: 1-55899-302-9; \$69.00 MRS members; \$76.00 US list; \$81.00 Non-US list

## AMF-3 PAPERS

### THIRD ASIAN MEETING ON FERROELECTRICS

The following is a list of titles and authors of oral and poster contributions given at AMF-3, held 12-15 December 2000 in Hong Kong, China.

#### PLENARY LECTURES

Ferroelectric and ferromagnetic microcrystalline glass ceramics

*Yao Xi*

Ferroelectrics: Looking back and looking ahead

*Nava Setter*

Recent development in high strain electroactive actuator materials

*L. Eric Cross*

Relaxor properties of dilute and concentrated polar solid solutions

*Wolfgang Kleemann*

Symmetry and antisymmetry in ferroelectric transducers

*R.E. Newnham*

Ferroelectric and antiferroelectric transitions in random copolymers of vinylidene fluoride and trifluoroethylene

*Takeo Furukawa*

Phase coexistence of hydrogen-bonded mixed crystals

*Sook-Il Kwun, Keum Hwan Noh, and Jong-Gul Yoon*

Studies of nanophase ferroelectric thin films for Gbit memories

*J.F. Scott, M. Dawber, S.A.T. Redfern, and Ming Zhang*

#### PROCESSING OF FERROELECTRIC MATERIALS

Low temperature sintering of PZT-based thick films

*Marija Kosec, Janez Holc, and Barbara Malic*

Investigation of high frequency (2.45 GHz, 30 GHz) sintering for Pb-based ferroelectrics and microscale functional devices

*S. Rhee, D.K. Agrawal, T.R. Shrout, and M. Thumm*

Synthesis of  $\text{YMnO}_3$  thin films from alkoxy-derived precursors

*Kazuyuki Suzuki, Kaori Nishizawa, Takeshi Miki, and Kazumi Kato*

MOCVD of barium strontium titanate capacitors for future DRAM applications

*J. Lindner, M. Schumacher, F. Schienle, D. Burgess, P. Strzyzewski, and H. Jürgensen*

#### SURFACES, INTERFACES, AND DEFECTS

Nanoscale properties of  $\text{SrBi}_2\text{Ta}_2\text{O}_9$  thin films

*Alexei Gruverman*

Effect of BNT addition on the properties of SBT ceramic and thin films

*H.X. Qin, J.S. Zhu, W.Y. Cai, P.P. Chen, W. Lun and Y.N. Wang*

Domain wall dynamics and scaling of Barkhausen noise in ferroelectrics

*Bosiljka Tadic*

Early-stage growth behavior of laser ablated epitaxial  $\text{SrRuO}_3$  thin films on  $\text{SrTiO}_3$  (001)

*Sang Sub Kim, Tae Soo Kang, and Jung Ho Je*

#### SENSORS, ACTUATORS, AND MICROWAVE DEVICES

Anomalous behavior of materials properties near ferroelectric phase transitions in single crystals, ceramics, and thin films

*Wolfram Wersing*

Novel approach to dynamic imaging of stress distribution with piezoluminescence

*Chao-Nan Xu, Hiroaki Matsui, Yun Liu, and Xu-Guang Zheng*

Single and double type microwave absorber using dielectric ( $\text{TiO}_2$ ) magnetic ( $\text{Fe}_2\text{O}_3$ ) composite material

*Takashi Yamamoto, Mituri Saito, Tugio Sakamoto, Hirotake Niori, Masaru Chino, and Masaki Kobayashi*

Effect of the electric field on the optimal properties of the obliquely cut pyroelectric crystals

*Vladimir Samoylov and Yung Sup Yoon*

Novel electroceramic transducers by fused deposition technique

*A. Safari*

Design of a new PZT-based microphone and microspeaker

*Ren Tiang-Ling, Zhang Lin-Tao, Liu Li-Tian, and Li Zhi-Jian*

Low-frequency characterization of laser ablation deposited thin  $\text{Na}_{0.5}\text{K}_{0.5}\text{NbO}_3$  (NKN) films for microwave application

*Saeed Abadei, Choong-Rae Cho, Alex Grishin, and Spartak Gevorgian*

## AMF-3 PAPERS

Improvement in material figure of merit of PLZT by samarium substitution

*Chandra Prakash, O.P. Thakur, and Pran Kishan*

Actuators piezoelectric ceramics and functional gradient materials

*Xinhua Zhu, Jianmin Zhu, Shunhua Zhou, Qi Li, Zhiguo Liu, Naiben Ming, Zhongyan Meng, Helen Lai Wa Chan, and Chungloong Choy*

Micromachined pyroelectric thin film IR sensors

*W.G. Liu, J.S. Ko, and W. Zhu*

Design and fabrication of microaccelerometers using piezoelectric thin films

*Jyh-Cheng Yu and Fu-Hsin Lai*

The oxydizing of grain boundary defects in BaTiO<sub>3</sub>-based PTCR ceramics

*Qi Jianquan, Gui Zhilun, and Li Longtu*

Design and driving characteristics of ultrasonic linear motor

*Tae Yoal Kim, Beom Jin Kim, Tae Gone Park, and Myong Ho Kim*

### CRYSTALS AND CERAMICS

Microwave dielectrics for tunable devices

*Amar S. Bhalla*

Neutron diffraction studies of Pb(Zr<sub>x</sub>Ti<sub>1-x</sub>)O<sub>3</sub> 0.20 ≤ x ≤ 0.54 ceramics

*Johannes Frantti, Jyrki Lappalainen, Sten Eriksson, Sergey Ivanov, Vilho Lantto, Masato Kakihana, Shigeru*

*Nishio, and Håkan Rundlöf*

Fatigue properties and microstructures of (Pb, Ca)TiO<sub>3</sub> ceramics

*Chien-Ru Lin, Chen-Chia Chou and Dah-Shyang Tsai*

Bismuth sodium titanate-based piezoelectric ceramics

*Dingquan Xiao, Zheng Wan, Jianguo Zhu, and Wen Zhang*

Crystal growth and electrical properties of high-T<sub>c</sub> relaxor-PT system single crystals

*N. Ichinose, Y. Saigo, Y. Hosono, and Y. Yamashita*

Ferroelectric phase transition of SrTi<sup>18</sup>O<sub>3</sub> studied by Brillouin scattering

*Yuhji Tsujimi, Hiroki Hasebe, Ruiping Wang, Mitsuru Itoh, and Toshirou Yagi*

Electrical properties of bismuth layer-structured ferroelectrics Sr<sub>m-3+x</sub>Bi<sub>4-x</sub>Ti<sub>m-x</sub>Ta<sub>x</sub>O<sub>3m+3</sub> (m=2, x=1-2; m=3, x=0-2)

*Hajime Nagata, Takeshi Takahashi, Shunsuke Miyamura, and Tadashi Takenaka*

Photoluminescence in heavily magnesium and erbium codoped lithium niobate

*H.X. Zhung, Y. Zhou, C.H. Kam, L.S. Qiang, C.Q. Xu, and Y.L. Lam*

Disordered feature in Rochelle salt

*Yoich Shiosaki, Katsumi Shimizu, and Ryusuke Nozaki*

### THEORY AND FUNDAMENTAL PHENOMENA

A model for a phase diagram with a Lifshitz point

*Ted Janssen*

The grain size effect of lead titanate glass-ceramic at microwave frequency

*Zhao Peng, Yao Xi, and Zhang Liangying*

Possibility of second electron gas on free ferroelectric surface and its effect on domain and size limit

*Yukio Watanabe and Akihiro Masuda*

Diffuse phase transition in perovskite ferroelectrics

*K. Prasad*

Origin of displacive type ferroelectricity in perovskite ATiO<sub>3</sub>

*Tetsuro Nakamura, Yue Jin Shan, Hideo Imoto, Mitsuru Itoh, and Yoshiyuki Inaguma*

Theory of the morphotropic phase boundary

*Yoshihiro Ishibashi*

Size effect study by bulk crystals: Optical and DC dielectric response of oxygen vacant BaTiO<sub>3</sub>

*Yukio Watanabe, G.A. Thomas, S.W. Cheong, and M. Okano*

High frequency measurements of P-E hysteresis curves of PZT thin films

*Takaaki Tsurumi, Song-Min Nam, Young-Bae Kil, and Satoshi Wada*

Studies of the thermal evolution of TGS single crystal by using variable-temperature electrostatic force microscopy and the effects of point defects

*E.Z. Lun, Z. Xie, B. Sundaravel,*

## AMF-3 PAPERS

*J.B. Xu, and I.H. Wilson*

Relaxor-based piezocrystals:  
Design, synthesis, and anisotropic  
properties

*Zuo-Guang Ye*

Dynamic response of relaxor  
ferroelectrics

*R. Pire and V. Bobnar*

Origin of ferroelectricity in the  
perovskite  $\text{ABO}_3$  crystals

*Wataru Kinase, Kenro  
Nakamura, and Koji Harada*

Structural phase transitions in  $\text{K}_{1-x}\text{Li}_x\text{Ta}_{1-y}\text{Nb}_y\text{O}_3$

*V.A. Trepakov, M.E. Savinov, E.  
Giulotto, P. Galinetto, P.  
Camagni, G. Samoggia, L.  
Jastrabik, and S. Kapphan*

### MICROELECTROMECHANICAL SYSTEMS (MEMS)

Micromachined pyroelectric thin  
films in sensors

*W.G. Liu, J.S. Ko, and W. Zhu*

The effect of processing parameter  
on the piezoelectric coefficients of  
thin films

*Dong-Guk Kim, Jeong-Ho Park,  
Il-Doo Kim, and Ho-Gi Kim*

Wet chemical etching of lead  
circonate titanate thin film for  
microelectromechanical systems  
applications

*Yin-Yin Liu, Qin Liu, Xi Yao,  
Wei-Ning Huang, and Tong-Ao  
Tang*

Antiferroelectric thin films for  
MEMS applications

*S.S.N. Bharadwaji and S.B.  
Krupanidhi*

### RELAXOR FERROELEC- TRICS

Electric boundary conditions on  
thermal strain behavior of relaxor  
single crystals

*Ruyan Guo*

Crystal structure of the relaxor  
ferroelectric  $\text{Pb}_2\text{ScTaO}_6$  in the  
paraelectric and ferroelectric states

*K.Z. Baba-Kishi and P.M.  
Woodward*

The field and frequency dependence  
of the strain and polarization in  
piezoelectric and electrostrictive  
ceramics

*W. Ren, A.J. Masys, G. Yang,  
and B.K. Mukherjee*

Effective piezoelectricity of PZT-  
based relaxor ferroelectric composi-  
tions

*Zhiqiang Zhuang*

PMN-PT detector and its application  
in electron acoustic imaging system

*Q.R. Yin, J.W. Fang, H.S. Luo,  
and G.R. Li*

Dielectric behavior and conforma-  
tional disorder in polymer relaxors

*B. Hilczer, H. Smogór, T.  
Pawlowski, S. Warchol, and M.  
Nowicki*

A unified picture of the ordered  
domains in relaxor ferroelectric lead  
magnesium niobate

*J.S. Liu, Z.R. Liu, H. Zheng, B.L.  
Gu, and X.W. Zhang*

Composition and implication of  
morphotropic phase boundary in  
PMN-PT systems

*Chen Ke-Pi, Zhang Xiao-Wen,  
and Fang Fei*

Spontaneous ferroelectric-relaxor  
transition of  $\text{Pb}(\text{Zn}_{1/3}\text{Nb}_{2/3})\text{O}_3$ -  
 $\text{PbZrO}_3$ - $\text{PbTiO}_3$  systems near  
morphotropic phase boundaries

*X.P. Jiang, J.W. Fang, H.R.  
Zeng, G.R. Li, D.R. Chen, and  
Q.R. Yin*

Effective piezoelectricity of PZT-  
based relaxor ferroelectric composi-  
tions

*Zhiqiang Zhuang*

PMN-PT detector and its application  
in electron acoustic imaging systems

*Q.R. Yin, J.W. Fang, H.S. Luo,  
and G.R. Li*

Light scattering and electric proper-  
ties of relaxor ferroelectric single  
crystals

*Chi-Shun Tu, L.-F. Chen, C.-L.  
Tsai, and B.-J. Cheng*

Radiospectroscopy investigation of  
relaxor ferroelectrics

*M.D. Glinchuk, V.V. Laguta, I.P.  
Bykov, and L. Jastrabik*

Domain boundary pinning and  
nucleation of ferroelectric  
( $\text{Pb}_{1-x}\text{Sr}_x$ ) $\text{TiO}_3$  ceramics

*Chun-Shu Hou and Chen-Chia  
Chou*

### DIELECTRIC, PIEZOELECTRIC, AND PYROELECTRIC PROPERTIES

Fabrication of low-firing piezoelec-  
tric ceramics and their applications

*Longtu Li and Zhilun Gui*

Effect of  $\text{Sb}_2\text{O}_5$  on the microwave  
dielectric properties of  
( $\text{Zr}_{0.8}\text{Sn}_{0.2}$ ) $\text{TiO}_4$  ceramics

*Yil Seok Ahn, Ki Hyun Yoon, and  
Eung Soo Kim*

## AMF-3 PAPERS

New functions of piezoelectrics for the superconductor

*Sunao Sugihara, Yukio Yutoh, Jun-Ichi Ueki, Masayoshi, and Yumi Uzawa*

Microstructural characteristics of  $\text{Ba}(\text{Mg}_{1/3}\text{Ta}_{2/3})\text{O}_3$  ceramics and their microwave dielectric properties

*I-Nan Lin, Mei-Hui Liang, Chen-Ti Hu, Hsiu-Fung Cheng, and John Steeds*

Studies of domain walls and their effect on switching properties in PZT, SBT, and BTO

*Y. Ding, J.S. Liu, and Y.N. Wang*

Dielectric properties and transition temperature of ceramics in the  $\text{Pb}(\text{Mg}_{1/3}\text{Nb}_{2/3})\text{O}_3$ - $\text{BaTiO}_3$  system

*Li Zhenrong, Li Qi, Zhang Liangying, and Yao Xi*

Piezoelectric properties orthorhombic lead barium niobate ceramics

*A. Bhanumathi, V.V.N. Acharya, and K. Uchino*

Elastically hinged molecule model in physics of ferroelectric materials

*Sergey V. Dmitriev, Kohji Abe, and Takeshi Shigenari*

## POLYMERS AND COMPOSITES

Ferroelectric ceramic/polymer composites and their applications

*D.K. Das Gupta*

Laser-induced phase transitions for patterning piezo- and pyroelectricity in ferroelectric polymers

*M. Wegener and R. Herhard-Multhaupt*

The relaxation properties of  $\text{PbTiO}_3$

composite materials on microwave frequency

*Zhai Jiwei, Yao Xi, Wu Mingzhong, and Zhang Liangying*

Nonlinear dielectric permittivity of PT/PVDF-free composites

*Bernd Ploss, Beatrix Ploss, F.G. Shin, H.L.W. Chan, and C.I. Choy*

## FERROELECTRIC THIN FILMS

Chemical deposition methods for ferroelectric thin films

*Rainer Waser, Theodor Schneller, Peter Ehrhard, and Susanne Hoffmann*

Ferroelectric phase transitions in films with depletion charge

*A.P. Levanyuk and A.M. Bratkovsky*

MOCVD of barium strontium titanate capacitors for future DRAM applications

*J.Lindner, M. Schumacher, F. Schienle, D. Burgess, P. Strzyzewski, and H. Jürgensen*

Intrinsic hysteresis loops in ferroelectric film systems

*Khian-Hooi Chew, Lye-Hock Ong, Junaidah Osman, Eng-Kiang Tan, and D.R. Tilley*

Effect of composition and growth temperature on the dielectric properties of  $\text{Pb}(\text{ScTa})_{1-x}\text{Ti}_x\text{O}_3$  (PSTT) thin films grown by MOCVD

*C.H. Lin, P.A. Friddle, C.H. Ma, and Haydn Chen*

Sol-gel derived  $(\text{Ba}_{0.5}\text{Sr}_{0.5})\text{TiO}_3$  thin

films on the electrical properties and reliability of PZT thin film capacitors

*Wangkyu Liu, Jungryul Ahn, Sungho Choo, Youngman Kim, and Jaichan Lee*

$\text{Ga}_2\text{O}_3$  thin films prepared from sol-gel process for oxygen and ozone gas sensing

*Yongxiang Li, Kosmas Galatsis, Wojtek Wlodarski, and John Gorman*

Ferroelectricity in nanostructured materials

*Yuhuan Xu and J.D. Mackenzie*

Electrical properties of novel fluorite/spinel heteroepitaxial double buffer layer structure on Si(001) for FET-type FRAM application

*Naoki Wakiya, Kazuo Shinozaki, and Nobuyasu Mizutani*

Interfacial states control of sputter deposited  $\text{Pb}(\text{Zr}_{0.52}\text{Ti}_{0.48})\text{O}_3$  thin films

*Soon Mok Ha, Woo Sik Kim, and Hyung-Ho Park*

Stability and read/write characteristics of nano ferroelectric domains

*Kwangsoo No, Seungbum Hong, and Jungwon Woo*

Fabrication and characterization of low dielectric constant ferroelectric material for field effect transistor

*Woo Sik Kim and Hyung-Ho Park*

Physical characterization and electrical properties of chelating-agents doped PZT thin films

*Te-Cheng Mo and San-Yuan Chen*

## AMF-3 PAPERS

The  $(\text{Ba}_{0.5}\text{Sr}_{0.5})\text{TiO}_3$  ferroelectric thin films prepared by sol-gel processing

*Gu Haoshuang, Zhao Min, and Yang Guang*

Aging effects on the ferroelectric properties of  $\text{YMnO}_3$  thin films

*H.Y. Guo, Ian H. Wilson, J.B. Xu, E.Z. Luo, W.Y. Cheung, N. Ke, and B. Sundar*

### GLASSES, DOMAINS, AND BOUNDARIES

The nature of the glass transition in canonical glasses: A look behind the "time trap"

*Jan K. Krüger*

Observation on creation and annihilation of  $90^\circ$  domain in  $\text{BaTiO}_3$  by scanning probe microscopy

*Sin Ichi Hamazaki, Fuminao Shimizu, Yoshiu Takahashi, and Masaaki Takashige*

Ellipsometric study of optical anisotropy of SBT thin films

*D. Mo, J.B. Xu, Y. Liu, X. Wang, and G.D. Hu*

Fast relaxation of some relaxor ferroelectric crystals by micro-Brillouin scattering

*Seiji Kojima, Fuming Jiang, and Qingrui Yin*

### NOVEL MATERIALS AND EXPERIMENTAL TECHNIQUES

High frequency LMM experiments and data analysis on ceramic thin films

*Sidney B. Lang*

Calorimetric study of

ferroelectromagnetic crystals,  $\text{KYMnO}_3$ ,  $\text{ErMnO}_3$ , and  $\text{LuMnO}_3$

*Toru Kyomen, Minoru Morita, Mitsuru Itoh, and Kay Kohn*

Light-induced ESR of dye-doped KDP

*Tomoyuki Hikita, Matsubo Tanimoto, Yosiaki Uesu, and Boris A. Strukov*

Electronic ferroelectricity in  $\text{ZnO}$

*S. Hagino, K. Yoshio, T. Yamazaki, T. Kubo, H. Sato, K. Matsuki, and A. Onodera*

### OPTICAL PROPERTIES AND NONLINEAR PHENOMENA

Light-induced absorption in pure and Fe-doped BCT crystals

*Maria Wierschem, Thiemo Lindemann, Siegmund Kappham, and Rainer Pankrath*

Proton exchanged  $\text{LiNbO}_3$  optical waveguides: Nonlinear electro-optical and photorefractive properties

*Yuri N. Korkishko, Vyacheslav A. Fedorov, Evgeny A. Baranov, Tamara V. Morozova, Sergey M. Kostritskii, and Fredrik Laurell*

Photoluminescence and triboluminescence of ferroelectric PZT at room temperature

*Yun Liu, Chao-Nan Xu, Morito Akiyama, and Tadahiko Watanabe*

Holographic storage properties of  $\text{Mn:Fe:LiNbO}_3$

*Xu Wusheng, Wang Rui, Shi Shaojun, Chen Xiaojun, and Wu Zhongkang*

## POSTERS

### NOVEL MATERIALS AND EXPERIMENTAL TECHNIQUES

Wet chemical synthesis of  $\text{BaTiO}_3$  powders and characteristics of the sintered ceramics

*Zhiqiang Zhuang, Xin Wang, and Hainiu Zhou*

Novel electrooptic polymer film

*Fang Changshui, Shi Wei, Pan Qiwei, Gu Qingtian, and Wu Xiangwen*

Preparation of sol-gel derived glass-ceramic with pure nanosized barium titanate crystals

*Zhao Peng, Yao Xi, and Zhang Liangying*

Hydrothermal synthesis of lead magnoniobate powder

*Wei Xiaoyong, Wang Minqiang, and Yao Xi*

Superconductor/ferroelectric heterostructures

*Li Lin, Hu Wenfei, Zhao Xinxjie, Chen Yingfei, and Wang Tiansheng*

Research on the dielectric and ferroelectric characteristics of  $(\text{Pb}_{1-x}\text{Sr}_x)\text{TiO}_3$  ceramics

*Mao-Xiang Wang, Tong Sun, and Ping Sun*

Crystal structures of  $\text{BaMgF}_{4-x}\text{O}_{x/2}$  thin films

*Xiaoli Wang, Shinobu Fujihara, and Toshio Kimura*

High pressure synthesis and properties of a perovskite  $\text{Bi}_{1/2}\text{Ag}_{1/2}\text{TiO}_3$

*Yoshiyuki Inaguma, Kazuhisa*



### AMF-3 PAPERS

*Kobashi, Misuru Itoh, Yue-Jin Shan, and Tetsuro Nakamura*

Crystal structure of ZnO:Li at 293 K and 19 K by X-ray diffraction  
*Keiji Yoshio, Akiro Onodera, Hiroyasu Satoh, Naboru Sakagami, and Haruyasu Yamashita*

Effect of Cu-doping on II-VI semiconducting ZnO  
*H. Satoh, K. Yoshio, T. Yamasaki, K. Matsuki, I. Shimono, N. Sakagami, and A. Onodera*

EPA detection of the anisotropic internal electric field and soft mode in the liquid-crystalline chromium (III) mesogen  
*N.E. Domracheva, I.V. Ovchinnikov, G. Lattermann, and A. Facher*

Ferroelastic phase transitions in triethylammonium and piperidinium chloroantimonate (V)  
*B. Bednarska-Bolek, G. Bator, and R. Jakubas*

PZT ferroelectric films  
*A. Deineka, M. Glinchuk, L. Jastrabik, G. Suchanek, and G. Gerlach*

Dielectric behavior of low-temperature sintered planar Z-type hexaferrite with Cu modification  
*Jianer Bao, Ji Zhou, Longtu Li, Hongguo Zhang, Zhenxing Yue, and Zhilun Gui*

Low-fire and high-performance Y5P dielectrics for high voltage multilayer ceramic capacitors  
*Xiukai Cai, Chunlei Wang, Peilin Zhang, Jinfeng Wang,*

*Weilie Zhong, Liangying Zhang, and Xi Yao*

Synthesis and application studies of castol oil/poly(methyl methacrylate) IPNs  
*Tang Dongyan, Cai Weimin, and Zhou Derui*

Study of technology parameters of preparing electrode materials of  $\beta$ -Ni(OH) $K_2$  nano powders  
*Xijiang Han, Chongquan Xu, Derei Zhou, and Li Zhao*

Preparation of PZT (53/47) thick films by 0-3 composite method  
*Xi-Yun He, Ai-Li Ding, Ping-Sun Qiu, and Wei-Gen Luo*

Growth and properties of  $Pb(Mg_{1/3}Nb_{2/3})O_3$  crystals  
*Yequan Zhao, Chunhui Yang, and Haosheng Luo*

Thermoelastic effect in ferroelectric materials induced by electron bombardment  
*Jian-Wen Fang, Xiang-Ping Jiang, Sen-Xing Hui, and Qing-Rui Yin*

Crystal structures and dielectric properties of novel ordered perovskite oxides  $A(Sc_{1/2}M_{1/2})O_3$  ( $A = Ca, Sr, M = Nb, Ta$ )  
*Yue Jin Shan, Ayuko Ozeki, Tetsuro Nakamura, and Mitsuru Itoh*

### CRYSTALS AND CERAMICS

Preparation and characteristics of infrared sensitive ferroelectric ceramic  $(Pb_{1-x}Sr_x)TiO_3$   
*Pin Sun, Maoxiang Wang, and Tong Sun*

A new IR nonlinear optimal material  $CsGeCl_3$   
*Q.T. Gu, C.S. Fang, X.W. Wu, Q.W. Pan, and W. Shi*

Melting behaviors of pyrochlores in  $Bi_2O_3$ -ZnO- $Nb_2O_5$  system  
*Wang Hong and Yao Xi*

The lithium isotope ( $^6Li$ ) effects in  $ALiSO_4$  ( $A = NH_4, Rb$ )  
*Tadashi Kurihama, Yong Jie Teng, Fuminao Shimizu, Masayuki Kimata, Takatoshi Izumi, and Toshihisa Yamaguchi*

Superlattice structure of ARS in the polar phase  
*Katsumi Shimizu, Toshio Kikuta, Ryusuke Nozaki, and Yoich Shiozaki*

Micro-Raman scattering study of ferroelectric-semiconductor  $Zn_{1-x}Li_xO$   
*Ehtesanul Islam, Akira Sakai, and Akira Onodera*

Phase transitions in  $C_8H_{20}IN \cdot 2CH_4N_2S$   
*H. Ishigami, Y. Tsunashima, M. Sumita, T. Hikita, and S. Sato*

$Ar^+$  ion irradiation and reduction effect in the  $MgO:LiNbO_3$  single crystals  
*Ill Won Kim, Sok-Won Kim, Byung Moon Jin, Sung Chul Kim, V.F. Pichugin, T.S. Frangulian, and V.F. Stoliarenko*

New design of ceramic gas sensors for better stability  
*P. Yu, D.Q. Xiao, and Y. Pan*

The effect of powder size on properties of ceramic gas sensors

### AMF-3 PAPERS

*P. Yu, D.Q. Xiao, Y.L. Zhuang,  
P. Li, and Y. Pan*

Effect of barium modification on electric properties of  $\text{Pb}(\text{Zr},\text{Sn},\text{Ti})\text{O}_3$  antiferroelectric ceramics

*Liu Peng, Yang Tongqing, Xu Zhao, Zhang Liangying, and Yao Xi*

Effect of  $\text{LiF}$  addition on the structure and dielectric properties of  $\text{Bi}_{1.5}\text{ZnNb}_{1.5}\text{O}_7$  based ceramics

*Xiukai Cai, Desheng Zhang, Liangying, and Xi Yao*

The processing and dielectric properties of bismuth-based ceramics

*Xiukai Cai, Desheng Zhang, Liangying Zhang, and Xi Yao*

Role of  $\text{TiO}_2$  and  $\text{WO}_3$  in improving the processing behaviors of bismuth-based ceramics

*Xiukai Cai, Desheng Zhang, Liangying Zhang, and Xi Yao*

The structure and dielectric properties of  $\text{Bi}_2\text{O}_3$ - $\text{ZnO}$ - $\text{Nb}_2\text{O}_5$  ceramics with  $\text{MF}_2$  and  $\text{TiO}_2$  added

*Xiukai Cai, Desheng Zhang, Liangying Zhang, and Xi Yao*

The structure and dielectric properties of bismuth-nickel-niobium oxide based ceramics

*Xiukai Cai, Desheng Zhang, Liangying Zhang, and Xi Yao*

Preparation of lead titanate ferroelectric ceramics by the improved sol-gel method

*Qiang Liangsheng and Xu Congquan*

Photorefractive property of  $\text{LiNbO}_3$  codoped with In and Fe

*Xu Wusheng, Wang Rui, and Chen Xiaojun*

Growth and characterization of V-doped  $(\text{KNa})_{0.1}(\text{Sr}_{0.75})_{0.9}\text{Nb}_2\text{O}_6$  crystals

*Yue-Li Zhang and Dang Mo*

Growth and spectrum property of  $\text{LiNbO}_3$  doped with Zn

*Li Minghua, Liu Xinrong, Yang Chunhui, Zhao Chaozhong, and Shao Zongshu*

Effect of lanthanum modification on electric properties of  $\text{Pb}(\text{Zr},\text{Sn},\text{Ti})\text{O}_3$  antiferroelectric ceramics

*Liu Peng, Xu Zhuo, Zhang Liangying, and Yao Xi*

Dielectric materials based on superimposed effect

*Chen Wei, Liu Bin, Wang Rongrong, and Chen Shoutian*

Study on the electrical breakdown phenomenon of  $\text{Sr}_{1-x}\text{Pb}_x\text{TiO}_3\cdot\text{m}(\text{Bi}_2\text{O}_3\cdot\text{nTiO}_2)$  ceramics

*Liu Bin, Chen Wei, Wang Rongrong, and Chen Shoutian*

Investigation of single and polydomain lithium niobate crystals by the SEM technique

*Lyudmila S. Kokhanchik*

### FERROELECTRIC POLYMERS AND COMPOSITES

Thermally stimulated current in different supermolecular structure of VDF/TrFE copolymers

*Xingyuan Zhang, Zhi Peng, Helen L.W. Chan, and Chung-Loong Choy*

Effects of electron irradiation on dielectric properties of ferroelectric vinylidene fluoride and trifluoroethylene copolymers

*Zhang Desheng, Yao Xi, Zhang Liangying, Shen Bo, Chen Xiaogang, and Yi Wenhui*

Dielectric property and ferroelectricity of poly(vinylidene fluoride-trifluoroethylene)

*Yi Wenhui, Yaoxi, Zhang Liangying, Shenbo, Cheng Xiaogang, and Zhang Desheng*

Ferroelectric properties of electron irradiated vinylidene fluoride and trifluoroethylene copolymer

*Chen Xiaogang, Zhang Liangying, Yao Xi, and Shen Bo*

Processing and electromechanical properties of lead-free piezocomposite

*R.P. Tandon*

Electrooptic properties of ferroelectric polymers

*J.C.Y. Ho and I.L. Guy*

Piezoelectricity and electrostriction in ferroelectric polymers

*I.L. Guy and Z. Zheng*

The dielectric and microwave absorbing properties of  $\text{PbTiO}_3$ -epoxy composites

*Mingzhong Wu, Jiwei Zhai, and Liangying Zhang, and Xi Yao*

Effective piezoelectric coefficients of ferroelectric 0-3 composites

*C.K. Wong, Y.M. Poon, and F.G. Shin*

The study of piezoelectric ceramic-metal composite with single cavity structure

### AMF-3 PAPERS

*Taosheng Zhou, Jing Wu, Keyu Zheng, and Anxiang Kuang*

The demand of low reflection on the complex permittivity of ferroelectrics based microwave absorbing materials

*Mingzhong Wu, Xi Yao, and Liangying Zhang*

Pyroelectric properties of ferroelectric polymer (PZT/PVDF) composite materials

*Yu Dashu and Han Jiecai*

Study of electron-irradiated characters of thin films of vinylidene fluoride/trifluoroethylene copolymer

*Shen Bo, Zhang Liangying, Yao Xi, Zhang Desheng, Chen Xiaogang, and Yi Wenhui*

Piezoelectric properties of samarium-modified lead titanate/polymer 0-3 composites

*Rong Zheng, Kin Wing Kwok, Bernd Ploss, Helen Lai Wah Chan, Chung Loong Choy, and Han Ming Zeng*

An investigation of the electrostrictive property of PZT/polyurethane particulate composites

*Y.W. Wong, L.S. Tai, and F.G. Shin*

Dielectric relaxation in BaTiO<sub>3</sub>/P(VDF-TrFE) composites

*Man-Chiu Cheung, Helen Lai Wa Chan, and Chung-Loong Choy*

Structure characteristics of 0-3 ceramic/polymer composites

*Q.Q. Zhang, Q.F. Zhou, H.L.W. Chan, and C.L. Choy*

Fabrication of barium titanate

(BaTiO<sub>3</sub>)-based nanocomposite by pulse electric current sintering (PECS) technique

*Hae Jin Hwang and Motohoro Toriyama*

Magnetoelectric effect in ferrite-ferroelectric composites

*K.K. Patankar, R.P. Mahajan, V.L. Mathe, R.B. Kale, A.N. Patil, M.B. Kothale, and S.A. Patil*

Studies on structural and magnetoelectric properties in CuFe<sub>1.8</sub>Cr<sub>0.2</sub>O<sub>4</sub>-Pb(Mg<sub>1/3</sub>V<sub>2/3</sub>)O<sub>3</sub> composites

*V.L. Mathe, K.K. Patankar, U.V. Jadhav, A.N. Patil, and S.A. Patil*

### GLASS AND AMORPHOUS SYSTEMS; NANOSTRUCTURES

Crystallization and dielectric properties of sol-gel derived ferromagnetic glass-ceramic

*Zhai Jiwei, Yao Xi, and Zhang Liangying*

Anomalous lattice expansion in BaTiO<sub>3</sub> nanoparticles and clusters

*Shin Tsunekawa, Kenji Ishikawa, Hisao Suzuki, Desheng Fu, and Yoshiyuki Kawazoe*

Study of crystallization from amorphous state of ferroelectric oxides by scanning probe microscopy

*Masaaki Takashige, Sin Ichi Hamazaki, Yoshio Takahashi, and Fuminao Shimizu*

Crystallization and dielectric properties of cordierite gel-derived glasses containing B<sub>2</sub>O<sub>3</sub> and P<sub>2</sub>O<sub>5</sub>

*Zhenxing Yue, Ji Zhou, Zhenwei Ma, Zhilun Gui, and Longtu Li*

Preparation and optical properties of transparent ferroelectric SBN-doped silica nanocomposites

*Sheng Guo Lu, Chee Leung Mak, and Kin Hung Wong*

### SURFACES, INTERFACES, AND DEFECTS

Cofiring behavior of interface in multilayer devices between ferroelectric and Ag/Pb alloy electrode

*Longtu Li, Ruzhong Zuo, and Zhilun Gui*

Cofiring diffusion behavior of composite multilayer ceramic capacitors with X7R characteristics

*Zhilun Gui, Hong Cai, and Longtu Li*

The mechanism and controlling of silver migration in a cofired multilayer chip with Ag/Pd inner electrodes

*Ruzhong Zuo, Longtu Li, and Zhilun Gui*

Effects of B<sub>2</sub>O<sub>3</sub>/Bi<sub>2</sub>O<sub>3</sub> on the cosintering behavior of dielectric/ferrite multilayer composites

*Zhenxing Yue, Longtu Li, Ji Zhou, and Zhilun Gui*

Effect of graded La-doping on the electrical properties of (Ba<sub>0.5</sub>, Sr<sub>0.5</sub>)TiO<sub>3</sub> thin films

*S. Saha and S.B. Krupanidhi*

Peculiarities of solid solutions based on Ca-doped ceramics BaTiO<sub>3</sub>

*A.M. Slipenyuk, I.P. Bykov, M.D. Glinchuk, A.G. Bilous, O.I.V. V'yunov, and L.L. Kovalenko*

Study on the interface behaviors between bismuth-based ceramics

### AMF-3 PAPERS

and electrodes

*Xiukai Cai, Chunxiang Cui,  
Chunlei Wang, Jinfeng Wang,  
and Weilie Zhong*

Interfacial structures and structural defects of  $\text{SrBi}_2\text{Ta}_2\text{O}_9$  ferroelectric thin films prepared by MOD and PLD

*Xinhua Zhu, Aidong Li, Tao Yu,  
Di Wu, Tao Zhu, Zhiguo Liu,  
and Naiben Ming*

Voltage offsets in ferroelectric PZT films with  $\text{RuO}_2$  electrodes

*B. Wang, K.W. Kwok, H.L.W. Chan, K.Y. Tong, and C.L. Choy*

Electrical properties and defect types of donor ( $\text{Nb}^{5+}$ ,  $\text{Ta}^{5+}$ )-doped  $\text{TiO}_3$

*Myong-Ho Kim, Soon-Il Lee,  
Tae-Kwon Song, Sahn Nahm,  
and Jae Dong Byun*

### RELAXOR FERRO-ELECTRICS

Ferroelectric anomalies of vinylidene fluoride and trifluoroethylene copolymer by electron irradiation

*Zhang Desheng, Yao Xi, Zhang Liangying, and Shen Bo*

The influences of processing on properties and microstructure of  $\text{Bi}_{1-x}\text{La}_x\text{Ti}_4\text{O}_{12}$  thin films

*H.X. Qin, Z.H. Bao, J.S. Zhu, Z.Q. Jin, and Y.N. Wang*

The phase transition of  $\text{Pb}(\text{Mg}_{1/3}\text{Nb}_{2/3})\text{O}_3$  -  $\text{PbTiO}_3$  67/33 single crystals

*Peng Bao, Feng Yan, H.S. Luo, P.C. Wang, Z.W. Ying, and Y.N. Wang*

The admittance spectroscopy of glassy behavior in relaxor ferroelectrics

*Hongkai Guo and Yening Wang*

Processing and properties of relaxor-type ferroelectric PNN-PSN perovskite ceramics

*Tadashi Sekiya, Keiji Kusumoto, and Yohiro Shimojo*

A Raman study of phase transitions in the  $\text{Pb}(\text{Zn}_{1/3}\text{Nb}_{2/3})\text{O}_3$ - $\text{PbTiO}_3$  system

*Makoto Iwata, Hidetaka Hoshino, Hiroshi Orihara, Hidehiro Ohwa, Naohiko Yasuda, and Yoshihiro Ishibashi*

Electrostrictive properties and polarization mechanisms of  $\text{Pb}(\text{Zn}_{1/3}\text{Nb}_{2/3})\text{O}_3$  ceramics

*Huiqing Fan, Litong Zhang, Yong-Hao Lee, and Hyoun-Ee Kim*

Glassy to ferroelectric crossover in relaxor ferroelectrics

*Vid Bobnar, Zdravko Kutnjak, Rasa Pirc, Robert Blinc, and Adrijan Levstik*

Nonlinear field dependence of the quasistatic and first harmonic dielectric response in relaxor materials

*Zdravko Kutnjak, Vid Bobnar, Cene Filipic, and Adrijan Levstik*

New critical behavior in relaxor ferroelectric  $\text{Pb}(\text{Mg}_{1/3}\text{Nb}_{2/3})$  -  $\text{PbTiO}_3$

*Alexei A. Bokov and Zuo-Guang Ye*

Study on order-disorder structure of relaxor ferroelectric  $\text{Pb}(\text{Zn}_{1/3}\text{Nb}_{2/3})\text{O}_3$ - $\text{PbTiO}_3$  single

crystal with composition near MPB  
*Yonghong Bing, Ruyan Guo, and A.S. Bhalla*

Ta-modified lead magnesium niobate-lead titanate crystalline solutions  $0.9 \text{PbMg}_{1/3}(\text{Nb}_{1-x}\text{Ta}_x)_{2/3}\text{O}_3$  -  $0.1\text{PbTiO}_3$

*J.T. Wang and F. Tang*

Effect of starting power size of  $\text{BaTiO}_3$  on relaxor behavior of ferroelectrics with

$\text{Ba}_{0.85}\text{K}_{0.15}\text{Ti}_{0.85}\text{Nb}_{0.15}\text{O}_3$  composition  
*Tao Li, Longtu Li, and Zhilun Gui*

Studies on the dielectric behavior of  $\text{Pb}(\text{Mg}_{1/3}\text{Nb}_{2/3})\text{O}_3$  -  $\text{PbTiO}_3$  relaxor thin films deposited by pulsed laser ablation technique

*A. Laha, P. Victor, and S.B. Krupanidhi*

Effect of stoichiometry on dielectric and piezoelectric properties of  $0.75\text{Pb}(\text{Ni}_{1/3}\text{Nb}_{2/3})\text{O}_3$  -  $0.25\text{PbTiO}_3$  ceramics

*Yong Zhang, Jiemo Tian, Longtu Li, and Zhilun Gui*

The field-induced phase transition from rhombohedral to tetragonal phase in PMNT single crystals

*Guisheng Xu, Haosu Luo, Donglin Li, Haiqing Xu, Zhenyi Qi, Pingchu Wang, and Zhiwen Yin*

The growth and electrical properties of ferroelectric  $(\text{Bi}_{3.25}\text{La}_{0.75})\text{Ti}_3\text{O}_{12}$  thin films for metal-ferroelectric-insulator-semiconductor field-effect transistor

*Taekjib Choi, Yong Sung Kim, and Jaichan Lee*

Relaxation behavior of

### AMF-3 PAPERS

(Sr,Ba)Nb<sub>2</sub>O<sub>6</sub> single crystal fibers  
*I.A. Santos, D. Garcia, E.R. Manuel, Y.P. Mascarenhas, A.C. Hernandez, and J.A. Eiras*

Dc- and ac-field dependent relaxor/ferroelectric properties in some disordered crystals  
*L.S. Kamzina*

Phase diagram of mixed relaxor ferroelectrics  
*M.D. Glinchuk, V.A. Stephanovich, E.A. Eliseev, and B. Hlczar*

### PROCESSING OF FERRO-ELECTRIC MATERIALS

Preparation of lanthanum zirconate stannate titanate (PLZST) antiferroelectric ceramics by modified coprecipitation method  
*Chen Ming, Yao Xi, and Zhang Liangying*

Powder preparation and sintering process on core-shell structures of (Pb<sub>0.6</sub>Sr<sub>0.4</sub>)TiO<sub>3</sub> materials  
*Chen-Chia Chou, Ping-Hong Chen, and I-Nan Lin*

Process optimization of pulsed laser deposited ferroelectric Pb<sub>0.6</sub>Sr<sub>0.4</sub>TiO<sub>3</sub> thin films on perovskite buffers  
*Jyh-Cheng Yu, Han-Chang Pan, Chen-Chia Chou, and Hsiu-Fung Cheng*

Low-temperature processing of Pb(Zr<sub>0.53</sub>Ti<sub>0.47</sub>)O<sub>3</sub> thin film by sol-gel casting  
*Tomoya Ohno, Shugo Ichikawa, Hisao Suzuki, and Takashi Hayashi*

The synthesis and characteristics of fibrous lead titanate nanometer ceramics

*Yu Dashu and Han Jiecai*

The study of low-temperature sintering modified PbTiO<sub>3</sub> piezoelectric materials  
*Taocheng Zhon, Wei Peng, Xunzhong Shang, Keyu Zheng, and Anxiang Kuang*

Growth and characterization of SrBi<sub>2</sub>Ta<sub>2</sub>O<sub>9</sub> thin films prepared by rapid thermal annealing  
*Huiqing Ling, Aidong Li, Di Wu, Mu Wang, Xiaobo Yin, Zhiguo Liu, and Naiben Ming*

Preparation of a modified (Pb,Ca)TiO<sub>3</sub> piezoelectric ceramic with two complex element substitution in B-site  
*Yusanwei Zhang, Xunghong Shang, Taosheng Zhou, Anxiang Kuang*

Fabrication of PZT multilayer actuators by a two-step sintering process  
*Yu Zhang, Kwan-Wai Tang, Peter Chou-Kee Liu, Yiu-Ming Cheung, Helen Lai-Wa Chan, and Chung-Loong Choy*

Milling precipitation method of powder synthesis for fabrication of dense submicron grained PZT derived ceramics  
*Alexander Golovchanski, Soon-Il Lee, Cheol-Su Youn, Tae-Gone Park, In Yong Park, and Myong-Ho Kim*

The effects of solvent on the ferroelectric properties of sol-gel derived PZT thin film  
*Ji Yun Jung, Woo Sik Kim, and Hyung-Ho Park*

The control of grain size of sol-gel

derived PZT thin film for the effective removal of orthonitrobenzaldehyde photosensitizer-stabilizer  
*Su-Min Ha, Woo Sik Kim, Hyung-Ho Park, and Tae-Song Kim*

The effect of orthonitrobenzaldehyde photosensitizer-stabilizer on the formation of PZT thin film by sol-gel procedure  
*Su-Min Ha, Woo Sik Kim, Hyung-Ho Park, and Tae-Song Kim*

Raman spectroscopy study of sol-gel derived potassium lithium niobate films  
*H.X. Zhang, Y. Zhou, K. Pita, C.H. Kam, Y.C. Chan, and Y.L. Lam*

Process optimization and characterization of epitaxially grown Ba<sub>x</sub>Sr<sub>1-x</sub>TiO<sub>3</sub> (0≤x≤1) thin films on SrTiO<sub>3</sub>(100) substrates  
*S.B. Majumder, P.S. Dobal, A. Dixit, A. Martinez, and R.S. Katiyar*

Preparation of sol-gel derived Pb(Sc<sub>1/2</sub>Nb<sub>1/2</sub>)O<sub>3</sub> (40%)-PbTiO<sub>3</sub> (60%) thin films with (100) and random crystallographic orientation  
*Bong Jin Kuh, Jai-Hyun Kim, Woong kil Choo, and Nava Setter*

Effect of TiO<sub>2</sub> doping on the microstructure and piezoelectric properties of PbNb<sub>2</sub>O<sub>6</sub>  
*Masataka Kato and Toshio Kimura*

## AMF-3 PAPERS

## THEORY AND FUNDAMENTAL PHENOMENA

Parasitic current effect on thermally stimulated current of polymers

*Zhi Peng, Xingyuan Zhang, Helen L.W. Chan, and Chung-Loong Choy*

Software compensation to the hysteresis loops of samples with high dielectric loss and high linear capacitor

*Chen Xiaogang, Yao Xi, and Zhang Liangying*

Investigation of phase transitions in Nb-doped  $\text{Pb}(\text{Zr}_{0.95}\text{Ti}_{0.05})\text{O}_3$  ceramics under hydrostatic pressure

*Wang Fanglin, Xu Zhuo, and Yao Xi*

Hydrostatic pressure-induced diffuse phase transition of antiferroelectric La-doped  $\text{Pb}(\text{Zr},\text{Sn},\text{Ti})\text{O}_3$  ceramics

*Xuy Zhuo, Fen Yujun, Zheng Shuguang, Jin An, Yao Xi, and Zhang Liangying*

Computer simulation for XRD patterns of piezoelectric crystal  $\text{Bi}_{12}\text{GeO}_{20}$

*Limei Rong, Shengxiang Bao, and Yonggong Ning*

Temperature dependence of lattice modes in lead titanate thin films

*D.S. Fu, H. Suzuki, and K. Ishikawa*

Powder X-ray diffraction study of ferroelectric phase transition in perovskite oxide  $\text{CdTiO}_3$

*Yue Jin Shan, Hajime Mori, Ruiping Wang, Hideo Imoto, Mitsuru Itoh, and Tetsuro Nakamura*

Ferroelectricity-evoking mass-inequality parameter for perovskite titanates  $\text{ATi}_y\text{O}_3$

*Tetsuro Nakamura, Yue Jin Shan, Mitsuru Itoh, and Yoshiyuki Inaguma*

Phase transitions in ferroelectric films

*Lye-Hock Ong, Junaidah Osman, Eng-Kiang Tan, and D.R. Tilley*

Intelligent multifunctional finite element modeling and analysis of resonant piezodevices

*S.A. Yerofeyev and A.A. Yerofeyev*

Raman spectrum and the origin of phase transitions in quartz

*Takeshi Shigenari, Kohji Abe, Sergey V. Dmitriev, Miki Yajima, Morihiro Nagamine, and Tigram A. Aslanyan*

Frequency spectrum of ferroelectric fatigue in PLZT ceramics

*Ningxin Zhang, Longtu Li, and Zhilun Gui*

Landau theory of interface stress effect on the phase transition properties of ferroelectric films

*C.L. Wang, W.L. Zhong, and P.L. Zhang*

Electronic structure of ferroelectric  $\text{PbZr}_{1/2}\text{Ti}_{1/2}\text{O}_3$  solid solution by first principal

*Y.X. Wang, W.L. Zhong, C.L. Wang, and P.L. Zhang*

Electronic structure and properties in perovskite  $\text{CaTiO}_3$  from first principles

*Y.X. Wang, W.L. Zhong, C.L. Wang, and P.L. Zhang*

Powder neutron diffraction studies on  $\text{CrOOH}$ -type zero-dimensional H-bonded crystals

*Toshihiro Fujihara, Mizuhiko Ichikawa, Tobjörn Gustafsson, Ivar Olovsson, and Takeshi Tsuchida*

Simulation of the poling of P(VDF-TrFE) with ferroelectric electrodes based on the Preisach model

*C.H. Tsang, Beatrix Ploss, Bernd Ploss, and F.G. Shin*

Experimental studies on the thermophysical behavior of PZT system ferroelectric ceramics

*Qingren Wu, Yunxian Chen, Changwei Lu, and Tonggeng Xi*

Investigation of the roles of oxygen vacancies on polarization fatigue in ferroelectric thin films

*V.C. Lo and Z. J. Chen*

Polarized Raman scattering spectra and the phase transition in a new ferroelectric, glycine phosphite (GPI) crystal

*Wang Lanyi, K. Abe, and T. Shigenari*

An approach to the PTC mechanism in donor-doped  $\text{BaTiO}_3$  ceramics

*Shenglin Jiang, Dongxiang Zhou, Xuyiing Guan, and Shuping Gong*

Scaling of dynamic hysteresis in ferroelectric mode systems: Monte-Carlo approach

*J.-M. Liu and Z.G. Liu*

Application of the path probability method to dynamical susceptibility in  $\text{KH}_2\text{PO}_4$ -type crystals

*Shun-Ichi and Koh Wada*

### AMF-3 PAPERS

Phenomenological thermodynamic theory for polarization reversal switching in ferroelectric  $\text{BaTiO}_3$

*Tae Kwon Song*

Scaling of ferroelectric hysteresis loops simulated from Landau-Khalatnikov equation

*Tae Kwon Song*

Fractal treatment in NHE theory of switch current impulses in ferroelectrics

*S.A. Sadykov and K.K. Kazbekov*

#### **DIELECTRIC, PIEZOELECTRIC, AND PYROELECTRIC PROPERTIES**

Effect of NiO additive on the structure and dielectric properties of  $\text{Bi}_2\text{O}_3$ -ZnO- $\text{Nb}_2\text{O}_5$  based ceramics

*Liu Yanping, Yao Xi, Zhang Liangying, Zhang Desheng, and Shen Bo*

The synthesis, structure, and dielectric properties of  $\text{Bi}_2\text{O}_3$ -ZnO-CaO- $\text{Nb}_2\text{O}_5$  ceramics

*Liu Yanping, Yao Xi, Zhang Liangying, Zhang Desheng, and Shen Bo*

Structure and dielectric properties of a distorted pyrochlore in  $\text{Bi}_2\text{O}_3$ -ZnO- $\text{Nb}_2\text{O}_5$  systems

*Wang Hong and Yao Xi*

Effects of  $\text{MnO}_2$  additive on dielectric properties and aging behavior of PNN biphasic ceramics

*Li Zhenrong, Zhang Liangying, and Yao Xi*

Investigation of dielectric properties of  $\text{Ba}_2\text{O}_3$ -ZnO- $\text{Nb}_2\text{O}_5$ - $\text{Sb}_2\text{O}_3$  based pyrochlores

*Du Huiling, Wang Hong, and*

*Yao Xi*

Crystal structure and dielectric properties of pyrochlore solid solutions in  $\text{Bi}_2\text{O}_3$ -ZnO- $\text{Nb}_2\text{O}_5$ -CuO systems

*Du Huiling, Wang Hong, and Yao Xi*

The effects of hydrostatic pressure on the dielectric response of relaxor ferroelectric  $\text{Pb}(\text{Zn}_{1/3}\text{Nb}_{2/3}\text{O}_3)$  based ceramics

*Xu Zhuo, Zheng Shuguang, Yue Zhenxing, Fen Yujun, Yao Xi, and Zhang Liangying*

Switching field with temperature variations in  $\text{Pb}(\text{Zr}, \text{Sn}, \text{Ti})\text{O}_3$  antiferroelectric ceramics

*Feng Yujun, Yao Xi, and Xu Zhuo*

Influence of composition on nonlinear piezoelectric coefficient in PZT ceramics

*K. Ishii, T. Murata, S. Tashiro, and H. Igarashi*

Dielectric properties of  $\text{Ti}_2\text{CoCl}_4$   
*Fuminao Shimizu and Masaaki Takashige*

Phase transition of copper-doped triglycine sulfate

*Toshio Kikuta, Toshinari Yamazaki, and Noriyuki Nakatani*

Dielectric anomalies in oxygen-isotope exchanged  $\text{SrTiO}_3$  single crystals

*Ruiping Wang and Mitsuru Itoh*

Effects of A-site ionic size mismatch on dielectric properties of  $\text{SrTiO}_3$

*Norihiko Sukamoto, Ruiping Wang, and Mitsuru Itoh*

Effect of gamma-ray irradiation on the dielectric properties in ferroelectric  $(\text{CH}_3\text{NH}_3)_5\text{Bi}_2\text{Cl}_{11}$  (MAPCB)

*Kazuo Gesi*

Dielectric study on the phase transition in  $(\text{NH}_4)_2\text{PdCl}_4$  and  $(\text{ND}_4)_2\text{PdCl}_4$

*Kazuo Gesi*

Electrical properties of the lead lanthanum zirconate titanate

*Ichiki Masaaki, Morikawa Yashushi, Ozaki Koichi, Tanaka Makato, and Maeda Ryutaro*

Electric fields dependence of dielectric properties for  $\text{Pb}(\text{Zn}_{1/3}\text{Nb}_{2/3})\text{O}_3$ - $\text{BaTiO}_3$ - $\text{PbTiO}_3$  solid solution ceramics

*Huiqing Fan, Litong Zhang, Yong-Hao Lee, and Hyoun-Ee Kim*

Precursor behavior of the ferroelastic phase transition in  $\text{K}_2\text{ZnCl}_4$

*Dal-Young Kim and Sook-Il Kwun*

Microwave dielectric properties of CuO doped

$\text{Ca}[(\text{Li}_{1/3}\text{LNb}_{2/3})_{1-x}\text{Ti}_x]\text{O}_{3-8}$  ceramics  
*Ji-Won Chou, Chong-Yun Kang, Seok-Jin Yoon, Hyun-Jai Kim, Hyung-Jin Jung, and Ki Hyun Yoon*

Microwave dielectric properties and far-IR reflectivity of  $(\text{Ca}_{0.275}\text{Sm}_{0.4}\text{Li}_{0.25})(\text{Ti}_{1-x}\text{Mn}_x)\text{O}_3$  ceramics

*Ki Hyun Yoon, Moon Soo Park, and Eung Soo Kim*

Dielectric, thermal, and electrical properties of  $\text{NH}_4\text{NCO}_3$

## AMF-3 PAPERS

*A.I. Ali and Insuk Yu*

Temperature distribution, heat loss, and frequency response of the multilayer pyroelectric structures  
*Vladimir Samoylov and Yung Sup Yoon*

Stretched exponential dielectric relaxation of disordered tungsten-bronze ferroelectric potassium lithium niobate crystals  
*Jin Soo Kim, Chung-Sik Kim, Tae Hoon Kim, and Jung-Nam Kim*

Diffuse phase transitions in  $\text{Pb}(\text{Mn}_{1/4}\text{Cu}_{1/4}\text{W}_{1/2})\text{O}_3$  ceramics  
*S.N. Choudhary, S.K. Sinha, R.N.P. Choudhary, and T.P. Sinha*

Dielectric and electromechanical properties of lead zirconate titanate ceramic added with neodymium  
*Janardan Singh and N.C. Soni*

Electromechanical effects in gallium nitride  
*S. Muensit and I.L. Guy*

Temperature dependence of electrostrictive properties of PMN-PT-La ceramics  
*G. Yang, S.-F. Liu, W. Ren, and B.K. Mukherjee*

Effect of uniaxial stress on the piezoelectric, dielectric, and mechanical properties of lead zirconate titanate piezoceramics  
*G. Yang, S.-F. Liu, W. Ren, and B.K. Mukherjee*

Microstructure and electrical properties of sol-gel derived  $\text{Pb}(\text{Zr,Ti})\text{O}_3$  nanocomposite

*Ming Dong and Zuo-Guang Ye*

Dielectric relaxation in  $(\text{Ba,Sr})\text{TiO}_3$  single crystals  
*D. Garcia, R. Guo, and A.S. Bhalla*

Oxygen vacancy related dielectric relaxation in  $\text{Bi:SrTiO}_3$   
*Chen Ang, Zhi Yu, Ruyan Guo, A.S. Bhalla, and L.E. Cross*

The low temperature dielectric anomaly of bismuth-based ceramics  
*Xuikai Cai, Chunlei Wang, Peilin Zhang, Weilie Zhong, Liangying Zhang, and Xi Yao*

The effect of  $\text{Sm}_2\text{O}_3$ -dopant on the microstructure and dielectric properties of  $\text{Ba}(\text{Ti}_{1-x}\text{Zr}_x)\text{O}_3$  ceramics  
*Yongli Wang, Jianqun Qi, Zhilun Gui, Qi Li, and Longtu Li*

Low dielectric constant borophosphosilicate glass ceramics: Synthesis and property  
*Bo Li, Ji Zhou, Zhenxing Yue, Zhenwei Ma, Zhilun Gui, and Longtu Li*

Microstructure and properties of nanostructured strontium lead titanate ceramic  
*Xiaohui Wang and Longtu Li*

Synthesis and properties of barium titanate based X7R-type ceramics by chemical method  
*Xiaohui Wang, Renzhen Chen, Zhilun Gui, and Longtu Li*

Piezoelectric properties of potassium lithium niobate single crystals  
*Masatoshi Adachi, Mayumi Nakatsuji, and Tomoaki Karaki*

Microwave dielectric properties of  $\text{Bi}(\text{Nb}_{1-x}\text{Ta}_x)\text{O}_4$  ceramics with  $\text{Cu}_2\text{V}_2\text{O}_7$   
*Eung Soo Kim, Je Hun Kim, Gi Gang Lee, Seung Gu Kang, and Pyung Kyu Kim*

Dielectric properties of  $(\text{Pb}_{0.45}\text{Ca}_{0.55})(\text{Fe}_{0.5}\text{Nb}_{0.5})\text{O}_3$  with  $\text{CuV}_2\text{O}_6$  at microwave frequencies  
*Eung Soo Kim, Jong Suk Jeon, Jin Chul Mun, Dong Won Kim, and Hyung Sig Jang*

Dependence of microwave dielectric properties on bond valence in  $(\text{Pb}_{1-x}\text{Ca}_x)(\text{Fe}_{0.5}\text{Nb}_{0.5})\text{O}_3$  ceramics  
*Eung Soo Kim, Yong Hyun Kim, Ki Hyun Yoon, Duk Hee Kim, and Yootaek Kim*

Study on PSZT piezoelectric ceramic of low firing temperature  
*Miao Jun, Zhou Taosheng, Chen Wen, and Zhou Jing*

Study on PZSN piezoelectric ceramic with high performances  
*Zhou Jing, Miao Jun, Xu Qing, and Chen Wen*

Thermodynamic and dielectric properties of sol-gel derived SBT thin film  
*Ming Zhu, Yu-Qing Zhou, and T.B. Tong*

Relation between phase transitional behavior and content of additive niobium oxide in PZT 97/3  
*Da Zhi Sun, Cui Feng Qu, Chun Hua Yao, Jing Du, Qi Hua Jin, and Sheng Wei Lin*

Dielectric relaxation behavior in  $\text{RE}^{3+}:\text{PbWO}_4$  ( $\text{RE}=\text{La}, \text{Y}$ ) scintillating crystals



## AMF-3 PAPERS

*Feng Xiqi, Wang Hongwei, Lin Qisheng*

A freestanding 4x4 pyroelectric sensor array with sputtered zinc oxide

*Nui Chong, Marcos Chun-Win Lam, Helen Lai-Wa Chan, and Chung-Loong Choy*

Rutherford backscattering analysis of compositionally graded

$\text{Ba}_x\text{Sr}_{1-x}\text{TiO}_3$  thin films

*Sudarman Upali Adikary, Balakrishnan Sundaravel, Helen Lai-Wa Chan, Ian Howard Wilson, and Chung-Loon Choy*

Pyroelectric composite

$\text{KTa}_{1-x}\text{Nb}_x\text{O}_3$  thin films with different compositions

*Shimin Wang, Huiguang Wu, Gangsheng Zhang, and Zuxing Chen*

Piezoelectric properties of  $\text{Pb}(\text{Zr}_{0.52}\text{Ti}_{0.48})\text{O}_3$  materials prepared by microwave sintering process

*Wan-Chui Lee, Kuo-Shung Liu, and I-Nan Lin*

Microwave dielectric properties characteristics of  $\text{Ba}(\text{Zn}_{1/3}\text{Nb}_{2/3})\text{O}_3$  materials synthesized by inverse-microemulsion process

*Kuo-Shiung Liu, Ming-Jou Kuo, and I-Nan Lin*

Effects of  $\text{MnO}_2$  and  $\text{Fe}_2\text{O}_3$  additives on the piezoelectric properties of 0.05PMN-0.451PT-0.499PZ ceramics

*Eun Seok Song, Sahn Nahm, Seok Jim Yoon, Myong-Ho Kim, and Jae Dong Byun*

Dielectric and piezoelectric properties of PZT substituted with samarium

*J.K. Juneja, Chandra Prakash, and T.P. Sharma*

Low frequency dielectric loss of nylon films from charging and discharging currents studies

*R.Madhuri, Ashok Kumar Sharma, R. Gopala Krishnan, and V.V.R. Narasimha Rao*

Dielectric and pyroelectric properties of ammonium tetracholozincate single crystals

*M. Amin, S.S. Ibrahim, M.A. Dabbour, A. El-Korashy, and S. Arafat*

Growth studies of  $(\text{Nb}_2\text{O}_5)_{1-x}:\text{xTiO}_2$  &  $(\text{Nb}_2\text{O}_5)_{1-x}:\text{xSiO}_2$  single crystals and their dielectric behavior

*H. Choosuan, R. Guo, and A.S. Bhalla*

Dielectric and piezoelectric properties of samarium modified lead titanate

*Chandra Prakash and Amar Bhalla*

Nonlinear optical properties of poly{(3-acetypyrrole-2,5diyl)[(P-N,Ndimethylamino)benzylidene]}

*Yi Wenhui, Yao Xi, and Zhang Liangying*

Preparation and nonlinear optical properties of  $\text{Y}_3\text{Fe}_5\text{O}_{12}$  nanocrystal glass composites

*Wang Minqiang, Wei Xiaoyong, Zhang Liangying, and Yao Xi*

Photoconductivity spectra of  $\text{PbWO}_4$  crystals

*Tae Hoon Kim, Kwanghee Lee, Min Su Jang, and Ji Hyun Ro*

SHG properties of pure and doped incipient ferroelectrics  $\text{KTaO}_3$  and  $\text{SrTiO}_3$  under applied electric fields

*Christian auf der Horst, Jörg Licher, Siegmur Kapphan, Valentin Vikhnin, and Serguei Prosandeyev*

Photoinduced intrinsic centers of lead and titanium in PLZT ceramics

*A.M. Slipenyuk, I.P. Bykov, M.D. Glinchuk, V.V. Laguta, L. Jastrabik, and J. Rosa*

Relation between chaotic behavior of nonlinear RLC-circuit and dynamics of polarization reversal in ferroelectrics

*Sergey N. Dorzhdin and Boris I. Ogienko*

Optical properties of PLZT thin films deposited by laser ablation

*Ján Lan, Miroslav Jelinek, Lubomir Jastrabik, and Ladislav Soukup, François Flory, and Ludovic Escoubas*

Nonlinear optics effect of codoped  $\text{Mg:Ga:LiNbO}_3$

*Xu Yuheng, Liu Caixia, Yang Chunhui, Zhao Chaozhong, and Shao Zongshu*

Nonlinear optics effects of codoped  $\text{Mg:Zn:LiNbO}_3$

*Li Minghua, Liu Caixia, Xu Wusheng, Zhang Wanlin, and Shao Zongshu*

Growth and optics properties of  $\text{LiNbO}_3$  codoped with  $\text{Er}^{3+}$  and  $\text{Mg}^{2+}$  or  $\text{Zn}^{2+}$

*Liu Huiling, Li Xiangzhong, Wang Rui, and Zhao Chaozhong*

### AMF-3 PAPERS

Investigation of photorefractive effect of Ce:Fe:LiNbO<sub>3</sub>

*Wang Rui, Liu Huiling, Xu Wusheng, Zhao Chaozhong, and Shao Zongshu*

Growth and phase conjugation effect of Ce:Eu:SBN

*Liu Xinrong, Liu Caixia, Zhu Zhibin, and Zhao Chaozhong*

Growth and property of stoichiometric LiNbO<sub>3</sub> crystals

*Wang Rui, Xu Wusheng, Zhu Zhibin, and Chen Xiaojun*

Growth and optical property of Nd:Zn:LiNbO<sub>3</sub>

*Xu Yuheng, Xu Wusheng, Zhu Zhibin, Zhao Chaozhong, and Shao Zongshu*

Study of optical properties of Mn:KLN crystals

*Chunhui Yanbg, Yequan Zhao, Xinhong Yang, Jun Wang, and Huide Gao*

Growth and properties of Zn:KLN crystals

*Yequan Zhao, Xinhong Yang, and Chunhui Yang*

Optical properties of polycrystalline and amorphous thin films of Pb(Zr<sub>x</sub>Ti<sub>1-x</sub>)O<sub>3</sub> prepared by a modified sol-gel technique

*Xin-Gui Tang, Al-Li Ding, Yang Ye, Ping-Sheng Qiu, Wei-Gen Luo, Hui-Qiu Li, and Dang Mo*

Light-induced absorption in (KNa)<sub>0.1</sub>(Sr<sub>0.6</sub>Ba<sub>0.4</sub>)<sub>0.9</sub>Nb<sub>2</sub>O<sub>6</sub> crystals

*Yue-Li Zhang, Sheng-Hong Yang, and Dang Mo*

Nonlinear optical characterization

of the generalized Fibonacci optical superlattices and their "isotopes"

*Yong-Yuan Zhu, Yi-Qiang Qin, Chao Zhang, Shi-Ning Zhu, and Nai-Ben Ming*

Optical properties of sol-gel derived SiO<sub>2</sub> thin films

*Chien-Kang Kao, Wee-Yih Lin, Hsun Chang, Chuen-Horng Tsai, and I-Nan Lin*

Photostrictive actuators: New perspective

*Kenji Uchino, Patcharin Poosanaas, and Kazuhiko Tonooka*

Photo-induced effect of ferroelastic phase transition in KD<sub>3</sub>(SeO<sub>3</sub>)<sub>2</sub>

*Masaki Takesada and Shin-Ya Koshihara*

Crystallographic features of the ferroelectric incommensurate phase in Pb(Zr<sub>1-x</sub>Ti<sub>x</sub>)O<sub>3</sub>

*S. Watanabe and Y. Koyama*

Enhanced piezoelectric property of potassium niobate single crystals with engineered domain configurations

*Satoshi Wada, Akira Seike, and Takaaki Tsurumi*

Domain imaging and local piezoelectric response of sputtered PbTiO<sub>3</sub> thin films using SPM

*X.F. Chen, W. Zhu, O.K. Tan, and X. Yao*

Domain structures of epitaxial Bi<sub>4</sub>Ti<sub>3</sub>O<sub>12</sub> thin films on (001) SrTiO<sub>3</sub> substrates

*X.Q. Pan, J.C. Jiang, C.D. Theis, and D.G. Schlom*

### FERROELECTRIC THIN FILMS AND MEMORY DEVICES

Study of a new ferroelectric sandwich structure

*Ren Tian-Ling, Zhang Lin-Tao, Liu Li-Tian, and Li Zhi-Jian*

Preparation and properties of Pb<sub>0.35</sub>Sr<sub>0.65</sub>TiO<sub>3</sub> films by magnetron sputtering method

*Ping Sun, Tong Sun, Qing Shu, Maoxiang Wang, and Yuliang Jian*

The performance of Al/PZT/ZrO<sub>2</sub>/Si FET structure

*Yan Lei, Tang Ting'ao, and Huang Weining*

Imprint of sol-gel derived PZT thin films

*Wei-Gen Luo, Pingsun Qiu, Ai-Li Ding, Xiyun He, and Ting-Ao Tang*

An improvement technology for fabrication of integrated Pb(Zr,Ti)O<sub>3</sub> ferroelectric capacitors

*Huang Weining, Lin Yinyin, Zhong Qi, Yan Lei, and Tang Tingao*

Study of top electrode postanneal effect on ferroelectric properties of Pt/SrBi<sub>2</sub>Ta<sub>2</sub>O<sub>9</sub>/Pt capacitors

*Di Wu, Aidong Li, Huiqing Ling, Tao Yu, Xinhua Zhu, and Naiben Ming*

Preparation of ZrO<sub>2</sub> thin film for metal-ferroelectric-insulator-semiconductor (MFIS) FETs application

*Yin-Yin Lin, Ting-Ao Tang, Wei-Ning Huang, and Guo-Bao Jiang*

## AMF-3 PAPERS

C-V characteristics of metal-ferroelectrics-insulator-semiconductor (MFIS) structure

*Yin-Yin Lin, Ting-Ao Tang, Wei-Ning Huang, and Guo-Bao Jiang*

Preparation of thicker  $\text{PbTiO}_3$  thin film by a metallorganic solution deposition process

*Gao Lumei, Wu Xiaoqing, Yao Xi, Wang Sanhong, and Zhang Liangying*

Preparation of  $\text{SiO}_2$  buffer layer by sol-gel process for multilayer pyroelectric thin film infrared sensor

*Wu Xiaoqing, Yao Xi, Ren Wei, Zhang Liangying, Wang Sanhong, and Gao Lumei*

The effects of micropatterning process on properties of sensitive elements of multilayer pyroelectric thin film infrared sensor

*Wu Xiaoqing, Yao Xi, Ren Wei, Wang Sanhong, Gao Lumei, and Zhang Liangying*

Contribution of electrodes to electrical properties of ferroelectric  $\text{Pb}_{0.6}\text{Sr}_{0.4}\text{TiO}_3$  thin films by pulsed laser deposition

*Han-Chang Pan, Chen-Chia Chou, and Hsiu-Fung Cheng*

Preparation and properties of  $\text{Bi}_{4-x}\text{La}_x\text{Ti}_3\text{O}_{12}$  thin films by chemical solution deposition

*Di Wu, Aidong Li, Tao Zhu, Huiqing Lin, Tao Yu, Zhiguo Liu, and Naiben Ming*

Fatigue characteristics of  $\text{Pb}(\text{ZrTi})\text{O}_3$  thin films prepared by metallorganic decomposition

*Feng Yan, Peng Bao, and*

*Yening Wang*

Extrinsic size effect on polarization switching in  $\text{SrBi}_2\text{Ta}_2\text{O}_9$  thin films

*Xiaobing Chen, Feng Yan, Chunhua Li, Di Wu, Jinsong Zhu, and Yening Wang*

Crystalline orientation control of rhombohedral phase PZT thin films

*Kouji Tokita, Masanori Aratani, and Hiroshi Funakubo*

Low temperature preparation of  $\text{SrBi}_2\text{Ta}_2\text{O}_9$  thin films by ECR plasma enhanced metallorganic chemical vapor deposition

*Norimasa Nukaga, Masatoshi Mitsuya, and Hiroshi Funakubo*

The stability of Bi element in  $\text{SrBi}_2\text{Ta}_2\text{O}_9$  thin film and the property of the film prepared by MOCVD

*Norimasa Nukaga, Hiroshi Funakubo, Emi Shigeno, and Yutaka Sawada*

Effect of composition of MOCVD- $\text{SrRuO}_3$  top electrode of  $(\text{Pb},\text{La})(\text{Zr},\text{Ti})\text{O}_3$  capacitor on  $\text{H}_2$  degradation

*Norikazu Okuda, Noriyuki Higashi, Takayuki Watanabe, and Hiroshi Funakubo*

Microstructure and properties of Mn- or Nb-doped  $\text{Bi}_4\text{Ti}_3\text{O}_{12}$  thin films by chemical solution deposition

*Hiroshi Maiwa and Noboru Ichinose*

Characteristic of  $\text{Pb}(\text{Zr},\text{Ti})\text{O}_3$  thin films prepared by source gas pulse-introduced MOCVD

*Masanori Aratani, Kuniharu Nagashima, and Hiroshi*

*Funakubo*

Compositional modification of Pb-based ferroelectric thin films in chemical solution processing

*Jeong Hwan Park, Ki Hyun Yoon, and Dong Heon Kang*

The electrical properties PZT/Pt/ $\text{Mg}_2\text{TiO}_4$ /Si thin films for MFMS nonvolatile memory

*Choon-Ho Lee and Jung-Hoon Yeom*

Characterization of Nb doped  $\text{Bi}_4\text{Ti}_3\text{O}_{12}$  thin films prepared by sol-gel method

*Tae Gyoung Kim, Sang Hern Lee, Heung Jin Joo, Jong Pil Kim, Min Ki Ryu, and Min Su Jang*

Hydrogen effect on switching properties of ferroelectric PZT thin films

*Heung Jin Joo, Sang Hern Lee, Jong Pil Kim, Min Ki Ryu, and Min Su Jang*

Ferroelectricity and electronic defect characteristics of  $\text{Sr}_{0.25}\text{Ba}_{0.75}\text{Nb}_2\text{O}_6$  thin films deposited on Si substrates

*Min-Ki Ryu, Heung-Jin Joo, Sang-Hern Lee, Yong-Suk Yang, and Min-Su Jang*

Metallorganic chemical vapor deposition of  $(\text{Br},\text{Sr})\text{RuO}_3$  oxide electrode for  $(\text{Ba},\text{Sr})\text{TiO}_3$  using nozzle-type injector

*Jeong-Hee Park, Joong-Seo Kang, Jae-Yul Lee, Duck-Kyun Choi, Young-Ki Han, Ki-Young Oh, and Chul-Ju Hwang*

Dielectric analysis of PZ/PZT

### AMF-3 PAPERS

multilayer thin films (in PZ/PZT series sequences) prepared by sol-gel technique

*Se-Hwan Bae, Kie-Beom Jeon, Byung Moon Jin, and Ill Won Kim*

Temperature dependent ferroelectric properties of  $\text{La}_{0.75}\text{Bi}_{0.25}\text{TiO}_3$  thin films prepared by pulsed laser deposition

*Ill Won Kim, Sung Hoon Kim, Sunglae Cho, Jong Seong Bae, Jong Kyu Lee, and Jung Hyun Jeong*

Crystal structure, microstructure and ferroelectric properties of PZT(55/45) and PZT(80/20) thin films due to various buffer layers

*Dong Heon Kang, Yong Joo Maeng, Sang Hyun Shin, Jeong Hwan Park, and Ki Hyun Yoon*

Structure and C-V characteristics of PZ/PZT multilayer thin films (in PZ/PZT series sequences) prepared by sol-gel technique

*Se-Hwan Bae, Kie-Beom Jeon, Byung Moon Jin, and Sung-Chul Kim*

Post-annealing in oxygen ambient for  $(\text{Ba},\text{Sr})\text{TiO}_3$  thin films prepared by pulsed laser deposition

*S.-G. Kim, D.-S. Paik, B.-H. Choi, Y.-W. Choi, D.-H. Kang, B.-H. Cho, and Y.-H. Kim*

Dielectric relaxation and ac conduction in copper doped lead titanate films prepared by sol-gel method

*R.P. Tandon*

Dielectric properties of sol-gel derived  $\text{PbTiO}_3/\text{Pb}(\text{Zr}_{0.52}\text{Ti}_{0.48})\text{O}_3$

and  $\text{BaTi}_3/\text{Pb}(\text{Zr}_{0.52}\text{Ti}_{0.48})\text{O}_3$  multilayer thin films

*Q. Zou, H. Ruda, B.G. Yacobi, and M. Farrell*

Abrupt appearance of the domain pattern and fatigue of thin ferroelectric films

*A.M. Bratkovsky and A.P. Levanyuk*

Modeling of leakage current in ferroelectric capacitors

*Matthew Dawber and J.F. Scott*

XPS analyses of  $(\text{Pb},\text{La})\text{TiO}_3$  ferroelectric thin films prepared by different techniques

*Jiliang Zhu, Dingquan Xiao, Lin Shen, and Dongping Hu*

The structural, dielectric, and ferroelectric properties of La-modified bismuth titanate thin films prepared by sol-gel process

*Jianguo Zhu, Dingquan Xiao, Jumu Zhu, Jiliang Zhu, Xiaowu Yuan, and Chi Yu*

Surface layer consideration of ferroelectric thin films for integrated ferroelectric device applications

*Dingquan Xiao, Jianguo Zhu, Jilian Zhu, and Kin Shen*

Study of layered structured ferroelectric materials grown by laser ablation

*S. Bhattacharya and S.B. Krupanidhi*

Structural and electrical properties of excess PbO doped

$\text{Pb}(\text{Zr}_{0.48}\text{Ti}_{0.52})\text{O}_3$  thin films using MOD process

*Zhitang Song, S.X. Wang, Xiaorong Fu, Lianwei Wang, L.M. Wang, Chenglu Lin, and*

*Helen L.W. Chan*

Growth of highly (100)-oriented Zr-rich PZT thin films on  $\text{Pt}/\text{Ti}/\text{SiO}_2/\text{Si}$  substrates by a simple sol-gel process

*Xiaorong Fu, Jinhua Li, Zhitang Song, and Chenglu Lin*

Effects of anneal atmosphere on the structural and ferroelectric properties of  $\text{SrBi}_2\text{Ta}_2\text{O}_9$  thin films

*Aidong Li, Huiqing Ling, Di Wu, Tao Yu, Zhiguo Liu, and Naiben Ming*

The role of interfacial diffusion in  $\text{SrBi}_2\text{Ta}_2\text{O}_9$  thin films capacitors

*Aidong Li, Di Wu, Huiqing Ling, Xinhua Zhu, Tao Yu, Zhiguo Liu, and Naiben Ming*

Correlating the local leakage current and ferroelectricity of PZT/YBCO by combined conducting atomic force and electrostatic force microscopes

*E.Z. Luo, Z. Xie, J.B. Xu, I.H. Wilson, H.B. Peng, B.R. Peng, B.R. Zhao, and L.H. Zhao*

Preparation and properties of  $\text{Pb}(\text{Zr},\text{Ti})\text{O}_3$  ferroelectrics thin films by RF magnetron sputtering

*Zhifeng Zhang and Y. Akiyama*

Mesoporous silica films fabricated with nanogranular silica sol by spin-coating technique

*Yin Mingzhi, Yao Xi, Wu Xiaoqing, Wang Hong, and Zhang Lianying*

Effects of organic templates on properties of sol-gel derived  $\text{TiO}_2$  films

*Yin Mingzhi, Yao Xi, Wu*

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Zhang Lianying*

Characterization and electrical  
properties of  $\text{Ba}(\text{Pb}_{1-x}\text{Bi}_x)\text{O}_3$  thin  
films by RF sputtering

*Cia-Liang Sun and San-Yuan  
Chen*

Properties of sol-gel PZT film based  
on indium-tin oxide substrate

*Li Jinhua, Yuan Ningyi, Chen  
Hansong, K.Y. Tong, Li Kun, and  
H.L.W. Chan*

A study of indium doped tin oxide  
as electrode of ferroelectric films

*Li Jinhua, Cheng Hansong, K.Y.  
Tong, Li Kin, and H.L.W. Chan*

Preparation of SBN/LSCMgO  
multilayer thin films by pulsed laser  
deposition

*Jiliang Zhu, Dingquan Xiao, and  
S.B. Palmer*

Raman investigation on  $\text{PbTiO}_3$  thin  
films deposited by MIBRECS

*Meng Chen, Dingquan Xiao,  
Jianguo Zhu, Lin Shen, and  
Jiliang Zhu*

Characteristics of  $\text{SrBi}_2\text{Ta}_2\text{O}_9$   
ferroelectric films on GaAs with a  
 $\text{TiO}_2$  buffer layer

*Liu Xiaohua, Z.G. Liu, Y.P.  
Wang, T. Zhu, J.M. Liu*

Electrical characteristics of  
 $\text{PbZr}_{0.52}\text{Ti}_{0.48}\text{O}_3$  thin films deposited  
on  $\text{RuO}_2$  electrodes

*Bing Wang, Kin Wing Kwok,  
Helen Lai Wah Chan, Kwok Ying  
Tong, and Chung Loong Choy*

Structural and ferroelectric proper-  
ties of  $\text{Pb}(\text{Zr}_{0.52}\text{Ti}_{0.48})\text{O}_3$  thin films on  
 $\text{LaNiO}_3/\text{Pt}$  coated Si substrates

prepared by sol-gel method

*Aidong Li, Qiyue Shao, Huiqing  
Ling, Di Wu, and Naiben Ming*

Thickness dependence of the  
structure properties of  $\text{BaTiO}_3$  film  
prepared by pulsed laser deposition  
(PLD)

*Kai Meng Yeung, Chee Leung  
Mak, Geoffrey Kin-Hung Pang,  
and K.Z. Baba-Kishi*

Fabrication and characterization of  
an all-perovskite ferroelectric field  
effect transistor based on  
 $\text{Pb}(\text{Zr}_{0.52}\text{Ti}_{0.48})\text{O}_3/\text{LaSrMnO}_3$   
heteroepitaxial structures

*K.S. So and K.H. Wong*

Heteroepitaxial growth of  
 $\text{Pb}(\text{Mg}_{1/3}\text{Nb}_{2/3})\text{O}_3\text{-PbTiO}_3$  thin films  
for integrated devices

*H.Y. Cheung, F.F. Hau, Jie  
Wang, and K.H. Wong*

Heteroepitaxial growth of ferroelec-  
tric  $\text{YBa}_2\text{Cu}_3\text{O}_{7-y}/\text{Pb}(\text{Zr}_{0.52}\text{Ti}_{0.48})\text{O}_3/  
\text{YBa}_2\text{Cu}_3\text{O}_{7-y}$  thin film capacitor on  
 $\text{Si}(001)$  by pulsed laser deposition

*P.W. Yip and K.H. Wong*

Structure and phase transition of  
 $\text{Bi}_4\text{Ti}_3\text{O}_{12}$  ferroelectric films pre-  
pared by RF sputtering of metal and  
metal oxide composed target

*Hailin Liu, Rui Xiong, Zhihong  
Lu, Zhengguo Zhou, Jing Shi,  
and Decheng Tian*

Structure and properties of PZT  
composite thick films derived by  
modified sol-gel process

*Q.F. Zhou, Q.Q. Zhang, H.L.W.  
Chan, and C.L. Choy*

On the nano-powder incorporated  
metallorganic decomposition  
process for the synthesis of Pb-

based ferroelectric thick films

*I-Nan Lin, Ying-Ru Chen, Yai-Yei  
Huang, Chen-Ti Hu, Kuo-Shung  
Liu, Wen-Jiun Liu, and Tsang-  
Lang Lin*

Properties of thick PZT films  
prepared by modified metallorganic  
decomposition process

*Cheng-Hsiung Lin, Yi-Nein Lai,  
and I-Nan Lin*

Preparation of epitaxial YSZ thin  
film on  $\text{Si}(001)$  using metal and  
oxide targets by RF-magnetron  
sputtering

*Nobuyasu Mizutani, Naoki  
Wakiya, Makoto Yoshida, and  
Kazuo Shinozaki*

Sputtering technology for high-  
volume ferroelectric memory  
production

*Koukou Suu*

Fatigue and switching characteris-  
tics of the  $\text{PLT}(10)$  thin films

*Dong Hoon Chang, Seong Jun  
Kang, Kook Pyo Lee, Sung Jin  
Kim, Hun Young Shon, and Yung  
Sup Yoon*

Pulse width dependent polarization  
of ferroelectric  $(\text{Pb},\text{La})(\text{Zr},\text{Ti})\text{O}_3$   
thin film capacitors for ferroelectric  
memory application

*Tae Kwon Song*

Temperature effects on fatigue and  
retention behaviors of  $\text{SrBi}_2\text{Ta}_2\text{O}_9$   
thin films fabricated by pulsed laser  
deposition

*Ill Won Kim, Hong Keun Kim,  
Chang Won An, Dong Geun  
Youn, Jung Hyun Jeong, and Sae  
Hwan Bae*

Effects of processing

### AMF-3 PAPERS

temperatures on microstructure and ferroelectric properties of PZT thin films prepared by pulsed laser deposition

*Min-Chul Kim, Hyun-Yong Shin, Dong-Soo Paik, Yong-Wook Park, Seok-Jin Yoon, Hyun-Jae Kim, and Ki Hyun Yoon*

The role of Pb-sufficient buffer layer for the long term stability of ferroelectric properties in Pt/PZT/Pt structure

*Jun -Kyu Yang, Woo Sik Kim, and Hyung-Ho Park*

Nitridation of Si surface using ICP for MeFIS-FET applications

*Taeho Kim, Hyung-Sub Min, June-Mo Koo, Jae-Gab Lee, Jaeheon Han, and Jiyoung Kim*

Influences of hydrogen damages in ferroelectric thin film capacitors

*June-Mo Koo, Taeho Kim, Hyung-Sub Min, Jin-Ho Ahn, Jae-Gab Lee, and Jiyoung Kim*

Characteristics of the MFIS structure fabricated with the LSMCD-derived SBT thin film and  $\text{TiO}_2$  buffer layer

*Joo Dong Park, Ji Woong Kim, and Tae Sung Oh*

Ferroelectric characteristics of the LSMCD-derived  $\text{SrBi}_{2.4}\text{Ta}_2\text{O}_9$  thin films

*Ji Woong Kim, Joo Dong Park, and Tae Sung Oh*

Ferroelectric PLZT thin films prepared by chemical solution deposition

*Dong Chan Woo, Chang Young Koo, and Hee Young Lee*

Effect of atmosphere on dielectric

and ferroelectric properties of PZT thin films produced by oxide precursors

*E.B. Araújo, D. Garcia, and J.A. Eiras*

Properties of lead magnesium niobate thin films obtained by pulsed laser deposition

*Floriana Craciun, Patricio Verardi, Maria Dinescu, and Raluca Dinu*

Low voltage switching in  $\text{Pb}(\text{Zr}_x\text{Ti}_{1-x})\text{O}_3$  thin films

*Seung-Hyun Kim, H.-J. Woo, D.-Y. Park, D.-S. Lee, J. Ha, C.-S. Hwang, and A.I. Kingon*

### SENSORS, ACTUATORS, TRANSDUCERS, AND ELECTROOPTICS

Lead lanthanum zirconate stannate titanate (PLZST) based antiferroelectric to ferroelectric phase change multilayer ceramic actuators

*Chen Ming, Yao Xi, and Zhang Liangying*

A split electrode piezoelectric actuator for high density rigid disk drives

*Wang Sanhong, Yao Xi, Wang Zhihong, and Zhang Liangying*

Preparation and properties of multilayer pyroelectric thin film infrared detectors

*Wang Sanhong, Yao Xi, Wu Xiaoqing, and Zhang Liangying*

Cymbal transducer array for hydrophone applications

*Li Denghua and Yao Xi*

Multilayer pyroelectric thin film

with a gradient thermal insulating layer

*Yun Liu, Wei Ren, Liang-Ying Zhang, Xi Yao, Chao-Nan Xu, and Tadahiko Watanabe*

Multifunction study of PZT thin films

*Chao-Nan Xu, Yun Liu, Morito Akiyama, and Kazuhiro Nonaka*

Energy transfer characteristics of the coupled mode of surface acoustic waves in PZT/Si configuration

*Junye Liu, Changho Lee, and Kwangsoo No*

A trapezoidal bending piezoelectric multilayer actuator by screen printing technology

*W. Zhu and Z. Zhe*

Online modeling & designing of one-layer and multilayer piezotransformers

*S.A. Yerofeyev and A.A. Yerofeyev*

Characteristics of Pd/BST/Pt for hydrogen detection at different ambient

*J. Deng, W. Zhu, O.K. Tan, X.F. Chen, and X. Yao*

Nondestructive pulse technique to characterize all relevant properties of special machined bulk PZT

*Jürgen Brünahl, Alexander Grishin, and Sergey Khartsev*

Effect of variables on ferroelectric electron emission

*Yong Tae Kim and Ki Hyun Yoon*

Analysis of class IV rare earth flexensional transducer using a mixed finite element-plane wave method

### AMF-3 PAPERS

*Lisheng Zhou, Tiejian Xia, Rong Cao, and Jinliang Fan*

Study of piezoelectric ceramic relay  
*Liying Chai, Taosheng Zhou, Xianghong Zhang, and Anxiang Kuang*

Measurement of the strain of piezoelectric ceramic and applications  
*Suolong Yu and Yenzen Yun*

A new construction of low voltage piezoelectric transformer  
*Jun Hui Hu, Hing Leung Li, Helen Lai Wa Chan, and Chung Loong Choy*

PT/P(VDF-TrFE) nanocomposites for ultrasonic hydrophone applications  
*Sien Ting Lau, Kin Wing Kwok, Helen Lai Wa Chan, and Chung Loong Choy*

Vibration characteristics of piezoceramic rings  
*Hing-Leung Li, Helen Lai-Wa Chan, and Chung-Loong Choy*

Resonance characteristics of lead zirconate titanate/epoxy 1-3 composite rings  
*Siu Wing Or and Helen Lai-Wa Chan*

Fabrication and characterization of 0.9PMN-0.1PT actuator

*Kwan-Wai Tang, Helen Lai-Wa Chan, Chung-Loong Choy, Yiu Ming Cheung, and Peter Chou Kee Liu*

Effect of frictional materials on the properties of a single-phase ultrasonic motor

*Nga-Yan Wong, Jun-Hui Hu, Helen Lai-Wa Chan, and Chung-Loong Choy*

Investigation on fabrication of PMN-PT ceramics

*Xiaojian Chen, Cuihong Zheng, Hongkai Guo, Jinsong Zhu, and Yeninig Wang*

Pyroelectric sensors with reduced vibration sensitivity

*Bernd Ploss, W.M. Fung, H.L.W. Chan, and C.L. Choy*

Cymbal actuators fabricated using PMN-PT single crystals

*K.H. Lam, H.L. Chan, H.S. Luo, Q.R. Yin, Z.W. Yin, and C.L. Choy*

### MICROELECTROMECHANICAL SYSTEMS

Sol-gel derived ferroelectric PZT films for MEMS applications

*Baomin Xu, L. Eric Cross, and Jonathan J. Bernstein*

A novel smart microactuator based on PZT/NITI heterostructure  
*Jinrong Cheng, Laiqing Luo, and Zhongyan Meng*

Study of thickness dependence on electrical properties of (Pb,Lu)TiO<sub>3</sub> thin films for memory applications  
*P. Venkateswarlu and S.B. Krupanidhi*

Fabrication and properties of microcantilever using piezoelectric PZT thin films

*Jungryul Ahn, Sungjin Jun, Dongwoo Kim, Jungwook Lee, Guenyong Yeom, Jibeom Yoo, and Jaichan Lee*

An investigation into the fabrication of Ni<sub>3</sub>Al/Ni composite thin films  
*Xu Weihua and Feng Duan*

Effect of temperature on antiferroelectric-ferroelectric phase transition of lead zirconate titanate stannate ceramics

*Yang Tongqing, Yao Xi, Liu Peng, Xu Zhuo, and Zhang Liangying*

Physical characteristics of photo-sensitive sol-gel derived PZT films for microcantilever

*San-Yuan Chen, Te-Cheng Mo, and Shu-Huie Lin*

### *Ferroelectricity Newsletter*

<http://www.sp.nps.navy.mil/projects/ferro/ferro.html>

The Adobe Acrobat PDF file format maintains the graphics and organization of the printed newsletter. Adobe Acrobat Reader is a helper application distributed free for Web browsers. Acrobat is available for Macintosh, Windows, DOS, SGI, and Sun SPARC operating systems.

*If you want a hard copy of the newsletter, you must let us know.*

**fax: +831-655-3734 e-mail: [liebmann@redshift.com](mailto:liebmann@redshift.com) or [rpanholzer@nps.navy.mil](mailto:rpanholzer@nps.navy.mil)  
mail: Hannah Liebmann, 500 Glenwood Circle, Suite 238, Monterey, CA 93940 USA**

## CONFERENCE REPORT

### **FERROELECTRICS 2000 UK**

*We are happy to bring you information on the Ferroelectrics 2000 UK conference. First, we reprint the foreword of the proceedings of Ferroelectrics 2000 UK, published by IOM Publications at the end of last year. (Ferroelectrics 2000 UK, Neil McN Alford and Eric Yeatman eds., IOMCommunications Ltd ISBN 1-86125-135-1) Second, we list the authors and titles of the papers given at the conference.*

#### **Foreword**

The first Institute of Materials Congress was held in 1998 on the campus of the Royal Agricultural College, Cirencester, Wiltshire. As part of this congress, a meeting on functional materials was organised by the institute's Electronic Applications Divisional Board (EADB). That meeting was very successful, and its proceedings were published as *Growth and Processing of Materials for Electronics*, N. McN. Alford Ed., Inst. of Materials Publishing (1998). Ferroelectrics emerged as a particularly strong theme within this meeting.

Consequently, the EADB organised a three day follow-on meeting, Ferroelectrics 2000 UK, within the general theme of Functional Materials at the Institute's Materials Congress 2000 (also at Cirencester). The meeting was remarkably successful, with the highest participation of any Congress session. This is perhaps unsurprising; ferroelectric materials are used in an enormous range of electronic devices, with a world market of tens of billions of dollars per annum. Applications include piezoelectric devices (transducers, sensors, filters etc.) microwave communications filters, uncooled infra-red detectors and imagers, displays and other optical devices, memories, and the rapidly growing field of micro-electro-mechanical systems (MEMS). The UK has taken a leading role in the development of many of these. The aim of the symposium was to provide a platform for displaying the UK's materials research and device developments in this exciting field, and a workshop for discussing the directions of the developments in ferroelectrics for the next millennium. The symposium incorporated the Fifth UK Transducer Materials and Transducers Workshop, and was organised as a bridge between the IoM Ceramics Division Congress and the IoM Congress 2000. The organising committee, and the meeting itself, were chaired by Professor Roger Whatmore; other committee members were Caroline Millar, David Hall, Robert Freer, Steve Mahon and ourselves. The sessions were lively and productive, reflecting the fact that the subject area is of growing importance within the UK and indeed worldwide. Plans for further collaboration between the members of the UK community are already in progress.

A very wide range of papers of excellent quality was presented, in the areas of processing, structural analysis, modelling, mechanical and electrical behaviour, MEMS and sensors. Following independent peer review of all submissions, we are now pleased to present these proceedings of Ferroelectrics 2000 UK. We anticipate that this volume, along with the Ferroelectrics UK meeting, will be the first of a regular series. On behalf of the Organising Committee, we express our sincere thanks to all the authors and participants.

Neil Alford  
South Bank University

Eric Yeatman  
Imperial College of Science Technology and Medicine

### **FERROELECTRICS 2000 UK PAPERS**

Ferroelectric Memories 2000  
*J. F. Scott*

Atomistic Modelling of Ferroelectric Perovskites  
*D. Porter*

Silver and Gold Surface-Modified Platinum Electrodes on Silicon for Lead Zirconate Titanate (PZT) Thin Film Growth  
*Rab Wilson, Qi Zhang and Roger W. Whatmore*

A Taguchi Study of Defects in the Fabrication of PZT Ceramics  
*A. Navarro, C. Shaw, J. R. Alcock and R. W. Whatmore*

Piezo AFM of Thin Film Lead Scandium Tantalum Oxide (PST)



## CONFERENCE REPORT

### Titanium Oxide (PZT)

*S. Dunn and R. W. Whatmore*

### The Nondestructive Evaluation of Crack Nucleation and Propagation of PZT Using Piezoelectric Signals

*K. Kageyama, H. Kato and Y. Matsunaga*

### Structure-Property Relationships in Soft PZT Ceramics

*Hong Zheng, Ian M. Reaney, Peiyi Wang and William E. Lee*

### The Antiferroelectric/Ferroelectric Phase Boundary in the La Doped $\text{Pb}(\text{Zr}, \text{Ti})\text{O}_3$

*J. Knudsen, I. M. Reaney and J. C. Fitzmaurice*

### Modelling of 3-3 Piezocomposites

*A. Perry, C. R. Bowen and S. Mahon*

### Piezoelectric Particulate Reinforced Nanocomposites

*S. R. Panteney, R. Stevens and C. R. Bowen*

### Lattice Stress Gradient Determination in Thin Films from the Asymmetry of Diffraction Lione Profile

*P. Sutta*

### Fracture of a Hard PZT Ceramic Under Compression Loading

*B. L. Cheng, M. J. Reece, F. Guiu and M. Alguero*

### Piezoceramics from Mechanochemically Activated Precursors

*L. Pardo, A. Moure, J. Ricote, P. Millán and A. Castro*

### Combined Thick-Film PZT/Micromachined Silicon Accelerometer

*S. P. Beeby, J. N. Ross and N. M. White*

### Electrostrictive Poly(Vinylidene Fluoride-Trifluoroethylene) Copolymers

*Q. M. Zhang, V. Bharti, Z.-Y. Cheng, H. S. Xu, T. B. Xu, T. Mai and S. J. Gross*

### Crystallisation Kinetics Study of Sol-Gel Prepared Lead Zirconate Titanate Thin Films

*Z. Huang, Q. Zhang and R. W. Whatmore*

### Computed Transmission Performance of a Frequency Selective Surface with Ferroelectric Substrates

*S. B. Savia and E. A. Parker*

### Growth and Characterisation of Lead Zirconate Titanate (30/70) Thin Films Using $\text{TiO}_2$ Seeding for Oxide Ferroelectric Liquid Crystal Display Application

*C. P. Shaw, S. S. Roy, R. W. Whatmore, H. Gleeson, Z. Huang, Q. Zhang and S. Dunn*

### Viscous Processed versus Conventional Piezoelectric Ceramics: Experimental Comparisons Using Real World Devices

*D. H. Pearce, G. Dolman, C. Meggs and T. W. Button*

### Plastic Forming Routes to Net Shape Ferroelectric Ceramics, Thick Films and Devices

*B. Su, D. H. Pearce and T. W. Button*

### Raman Characterisation of Ceramic Lead Zirconate Titanate

*S. J. Webb, N. McN. Alford, M. Poole and M. J. Reece*

### $\text{SrBi}_2(\text{Ta}, \text{Nb})_2\text{O}_9$ Ferroelectric Thin Film Capacitors by Metalorganic Decomposition

*J. P. Mercurio, J. H. Yi, C. Legrand, M. Manier, P. Thomas and R. Guinebretiere*

### Growth of Extremely Smooth Epitaxial $\text{SrBi}_2\text{Ta}_2\text{O}_9$ Films on $\text{SrTiO}_3$ Substrates

*Ashish Garg and Zoe H. Barber*

### Post-Growth Processing of Ferroelectric Crystals for Non-Linear Optical Devices: Fabrication and Characterisation

*P. A. Thomas, Q. Jiang, T. Latham, K. B. Hutton and R. C. C. Ward*

### Ferroelectricity in Aurivillius Phases

*I. M. Reaney, D. Suarez and W. E. Lee*

### Second Phase in $\text{BaB}'_{0.33}\text{B}''_{0.67}\text{O}_3$ Microwave Dielectrics

*M. Li, K. M. Moulding and D. J. Barber*

### Paint Based Piezoelectric Thick-Film Strain Sensors

*J. M. Hale and B. de Poumeyrol*

### Solid State Sensors for $\text{SO}_3$ , $\text{NO}_2$ , $\text{HCl}$ and $\text{CO}_2$

*G. M. Kale, L. Wang and Y. R. Hong*



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**UPCOMING MEETINGS**

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**Thirteen American Conference on Crystal Growth and Epitaxy (ACCGE-13)  
12 – 16 August 2001  
Burlington, Vermont, USA****Scope**

ACCGE-13 will provide a forum for the presentation and discussion of recent research and development activities in all aspects of bulk crystal growth and epitaxial thin film growth, with sessions integrating fundamentals, experimental and industrial growth processes, characterization, and applications. Contributed papers will be accepted in all relevant areas. In addition to focused sessions on the topics listed below, sessions will be organized based upon the topical distribution of contributed papers. The conference will include both oral and poster sessions.

**Contributed Papers**

Abstracts are due 15 March 2001. Authors should submit their abstracts interactively through the web site [www.crystalgrowth.org/conferences/accge13/](http://www.crystalgrowth.org/conferences/accge13/). If web access is not available, authors may request a paper abstract form and guidelines from the ACCGE-13 Secretariat, Tony Gentile. Authors may request a poster or oral presentation and a session topic for their presentation, but the program chairs will set the program scheduled based on the conference requirements. Late news abstracts are due 1 June 2001, and will be assigned as poster presentations. No proceedings will be published from this meeting.

**Industrial Exhibit**

An exhibit of apparatus, materials, and services of interest to the crystal growth community will be held in an area adjacent to the technical sessions. Vendors interested in contracting space should contact:

Larry Mann, Advanced Ceramics  
PO Box 94924, Cleveland, OH 44104-4924  
phone: +216-529-3959 fax: +216-529-3975 Mannl@advceramics.com

**Photography Contest**

A photo contest will be held during the conference. Participants are invited to submit photographs that portray scientific, technical, and artistic aspects of crystals, crystal growth, or characterization. The deadline for submission is 15 July 2001. Guidelines on format of the entries and submission information are available on the website.

**Focused Sessions**

Session / *Organizer; invited speakers to date*

Bulk growth of semiconductors / *D. Carlson;*

Crystal Growth Fundamentals / *R. Braun; B. Murray (SUNY Binghamton), J. Sethian (UC Berkeley), B. Spencer (SUNY Buffalo)*

Epitaxial Growth / *M. Mauk;*

Industrial Crystallization / *V. Balakrishna; L. Rowland (Sterling Semiconductors)*

In-situ Diagnostics / *A. Allerman; W. Breiland (Sandia National Laboratory)*

Macromolecular Crystallization / *A. Malkin, C. Orme;*

Modeling / *S. Motakef*

MBE for High-Speed Electronic Devices / *B. Bennett; D. Streit (TRW), B. Orr (University of Michigan)*

Microgravity Growth / *D. Matthiesen;*

Nanotechnology / *T. Kuech, D. Kaiser;*

NLO, Photorefractive & Laser Crystals / *P. Schunemann, B. Wechsler;*

OMVPE / *J. Olson, C. Wang; A. Allerman (Sandia National Laboratories), J. Olson (National Renewable Energy Laboratory)*

**UPCOMING MEETINGS**

OMVPE for Optoelectronic Materials / *C. Ebert, K. Campbell; C. Joyner (Bell Laboratories), C. Miner (Nortel Networks)*  
Oxides: Substrates and Films / *P. Salvador;*  
Si Crystal Growth for Photovoltaic and Electronic Applications / *T. Ciszek;*  
SiC Bulk Crystal and Epitaxial Growth / *I. Bhat, V. Heydemann; D. Larkin (NASA), R. Leonard (Cree Research)*  
Wide Band Gap Materials: Nitrides / *R. Biefeld; R. Molnar (MIT Lincoln Laboratory), M. Manfra (Bell Laboratories)*  
X-ray Diffraction for Crystal Perfection and Growth / *A. Chernov, I. Robinson; J. Tischler (Oak Ridge National Laboratory), B. Stephenson (Argonne National Laboratory)*

**AACG Crystal Growth Awards**

The *Young Author Award* for fresh and imaginative contributions to the field of crystal growth and the *Gentile Service Award* for exemplary service to AACG will be presented at ACCGE-13. Details on the nomination process are available on the website.

**Conference Organizing Committee**

- Conference Chairs - *Debra Kaiser, Steve Licht*
- Program Chairs - *Gary Ruland, Christine Wang*
- Local Arrangement - *David Bliss, Peter Schunemann*
- Vendor Exhibit - *Larry Mann*
- Industrial Support - *Vijay Balakrishna, Vincent Fratello*
- Government Support - *Robert Biefeld, Patricia Morris*
- Awards - *Eric Monberg, Rose Scripa*
- Photography Contest - *Lara Keefer, Glen Kowach*
- Publicity - *Katherine Gudgel, Keith Torrance*
- Financial Aid - *David Bliss*
- Webmaster - *Eric Monberg*
- Foreign Liaison - *Eric Monberg*

**“Advanced Materials for Novel Microwave Devices”  
Special Focused Session at the 2001 Asia Pacific Microwave Conference (APMC 2001)  
3 – 6 December 2001, Taipei, Taiwan**

**Call for Papers**

Authors are invited to submit original contributions in the area of dielectrics, ferroelectrics, and ferrites in the form of bulk ceramics, tapes, and thin films, materials or devices for application at RF and microwave frequencies to be published in the *APMC Proceedings Digest*.

Guidelines for submissions are available at the APMC 2001 website: [www.ee.ntu.edu.tw/apmc2001](http://www.ee.ntu.edu.tw/apmc2001). The manuscripts should be submitted electronically at the APMC 2001 website on or before 1 April 2001.

**Contact**

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**APMC 2001 Secretariat, Prof. Jean-Fu Kiang**, Department of Electrical Engineering, National Taiwan University  
fax: +866-2-2365-1744; [Apmc2001@ew.ee.ntu.edu.tw](mailto:Apmc2001@ew.ee.ntu.edu.tw)

**CALENDAR OF EVENTS 2001**

Mar 5-8 • “Active Materials: Behavior and Mechanics (ss08),” Part of SPIE's 8th International Symposium on Smart Structures and Materials, Newport Beach, California, USA (see *Ferroelectricity Newsletter*, Vol. 8, No. 4, p. 22)

Mar 11-14 • 13th International Symposium on Integrated Ferroelectrics (ISIF 2001), Colorado Springs, Colorado, USA (see *Ferroelectricity Newsletter*, Vol. 8, No. 4, p. 32)

Apr 16-20 • MRS 2001 Spring Meeting, San Francisco, California, USA (see *Ferroelectricity Newsletter*, Vol. 8, No. 4, p. 33)

Aug 5-11 • 8th International Conference on Ferroelectric Liquid Crystals (FLC 2001), Washington, D.C., USA (see *Ferroelectricity Newsletter*, Vol. 8, No. 4, p. 34)

Aug 12-16 • 13th American Conference on Crystal Growth and Epitaxy, Burlington, Vermont, USA (see p. 26)

Sep 3-7 • 10th International Meeting on Ferroelectricity (IMF-10), Madrid, Spain (see *Ferroelectricity Newsletter*, Vol. 8, No. 4, p. 35)

Dec 3-6 • “Advanced Materials for Novel Microwave Devices” **at the 2001 Asia-Pacific Microwave Conference (APMC 2001), Taipei, Taiwan (see p. 27)**